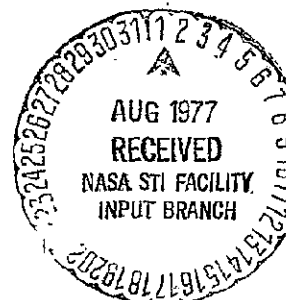


BOEING

Solid Rocket Booster
Performance Evaluation Model
VOLUME IV - PROGRAM LISTING

(NASA-CR-150338) SOLID ROCKET BOOSTER
PERFORMANCE EVALUATION MODEL. VOLUME 4:
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SOLID ROCKET BOOSTER PERFORMANCE EVALUATION MODEL

Solid Rocket Booster Performance Evaluation Model **VOLUME IV — PROGRAM LISTING**

PREPARED BY

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1.0 INTRODUCTION

This document contains Volume IV of a set of four volumes which describe the SRB-II program. Volume I contains the engineering description, Volume II contains the User's Manual, Volume III contains the sample case prediction, and Volume IV contains the program listing.

The SRB-II program listing presented in this Volume is divided into two parts due to the size of the program. Part One is an INDEX listing of the subprograms or routines associated with all program modules except the Internal Ballistics Module (IBM) and the Nozzle Submergence and Contour Effects Module (NSCE). Part Two is an INDEX listing of all the routines associated with the IBM and NSCE Modules.

The INDEX listing is a valuable tool in program analysis. The INDEX program analyzes FORTRAN source programs and produces a directory (or index) of variable names and statement numbers used in the routines. For each routine, the INDEX listing output consists of:

- (1) A complete listing of the source routine.
- (2) A directory of statement numbers in ascending order. Each statement number is identified as to its location in the routine listing. Also, each reference to a statement number is identified.
- (3) A directory of variable names in alphanumeric order. Each variable name present in the routine is listed along with an identification of its function and location.

When more than one routine is present in a FORTRAN source program (as is the case with SRB-II), a SUPER INDEX is printed following the output for the last routine. The SUPER INDEX presents a list of every variable and routine name used in the entire source program. When a name is present in more than one routine, the routines are identified in alphanumeric order.

The final part of an INDEX listing is the Table of Contents. It consists of an alphanumeric list of each routine present in the INDEX and the page on which each routine begins. The INDEX program assigns page numbers to the print that it produces and uses these page numbers in the Table of Contents. These page numbers are located in the upper right corner of the print.

2.0 PROGRAM LISTING, PART ONE

This first part of the SRB-II program listing contains an INDEX listing of the routines associated with the following modules:

- (1) Executive Module (MAIN)
- (2) Centralized Input Module (INPUT, GETDAT)
- (3) BATES Isp Module (BATES)
- (4) Isp Scaling Module (SISCAL)
- (5) Contractor Data Isp Module (CDSI)
- (6) Reconstruction Module (RECØN)
- (7) Dispersion Module (DISP)
- (8) Thrust Scaling Module (FSCAL)
- (9) Inert Mass Module (INERT)
- (10) Output Module (ØUTPUT)

The program listing for the remaining two modules, the Internal Ballistics Module and the Nozzle Submergence and Contour Effects Module, is presented in Part Two.

The INDEX listing begins on the following page. The SUPER INDEX begins on page 2-354 and the Table of Contents begins on page 2-377.

```

C      SPACE SHUTTLE SOLID ROCKET BOOSTER PERFORMANCE EVALUATION MODEL
C
C      EXECUTIVE MODULE (ROBERTS)
C
1      IMPLICIT REAL (A-H,O-Z,M)
2      LOGICAL ERR
3      COMMON/BLK001/IRKT01,IRKT02,ERR,IN
4      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE      ALL
5      COMMON/BLK012/ NPRINT
6      COMMON/BLK025/ NTAPE,NPLOT,NCARD
7      NCASE=0
8      CALL PRESET
9      10 CALL INPUT
10     CALL INIT1
11     NPRINT=1
12     CALL OUTPUT
13     IF(NRECON.GT.0) GO TO 100
14     20 GO TO (30,40,50,60),NSI
15     30 NPRINT=2
16     CALL SISCAL
17     GO TO 60
18     40 NPRINT=3
19     CALL CDSI
20     GO TO 60
21     50 NPRINT=4
22     CALL BATES
23     IF(ERR) GO TO 110
24     60 IF(NDISP.EQ.0) GO TO 80
25     NPRINT=5
26     CALL DISP
27     80 IF(NF.GT.0) GO TO 90
28     IF(NF.LT.0) GO TO 110
29     NPRINT=6
30     CALL FSCAL
31     GO TO 110
32     90 NPRINT=7
33     CALL IBM
34     GO TO 110
35     100 NPRINT=8
36     CALL RECON
37     110 NCASE = NCASE + 1
38     IF(NPLOT.GT.0) END FILE 13
39     IF(NTAPE.GT.0) CALL OUTTAP
40     IF(NCASES.EQ.NCASE) GO TO 120
41     GO TO 10
42     120 WRITE(6,130)
43     130 FORMAT('1',28(/),T45,'A L L D A T A C A S E S C O M P L E T E D
      $')
44     STOP
45     END

```

SYMBOL	-----	REFERENCES	-----
10	" 9*	41	
20	" 14*		
30	" 14	15*	
40	" 14	18*	
50	" 14	21*	
60	" 14	17	20 24*
80	" 24	27*	
90	" 27	32*	
100	" 13	35*	
110	" 23	28	31 34 37*
120	" 40	42*	
130	" 42WR	43*	
* BATES	" 22*		
* BLK001	" 3*		
* BLK005	" 4*		
* BLK012	" 5*		
* BLK025	" 6*		
* CDS1	" 19*		
* DISP	" 26*		
ERR	" 2LG	3C0 23	
* FSCAL	" 30*		
* IBM	" 33*		
IN	" 3C0		
* INIT1	" 10*		
* INPUT	" 9*		
IRKT01	" 3C0		
IRKT02	" 3C0		
NCARD	" 6C0		
NCASE	" 4C0	7= 37= 40	
NCASES	" 4C0	40	
NDISP	" 4C0	24	
NF	" 4C0	27 28	
NLEWIS	" 4C0		
NPL0T	" 6C0	38	
NPRINT	" 5C0	11= 15= 18= 21= 25= 29= 32= 35=	
NRECON	" 4C0	13	
NSI	" 4C0	14	
NTAPE	" 6C0	39	
* OUTPUT	" 12*		
* OUTTAP	" 39*		
* PRESET	" 8*		
* RECON	" 36*		
* SISCAL	" 16*		
* STOP	" 44*		

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INDEX

SUBROUTINE BIAS

PAGE 3

```

1      SUBROUTINE BIAS
2      C      THIS ROUTINE WILL BIAS DATA FOR RECONSTRUCTION
3      RETURN
      END

```

SYMBOL		REFERENCES	
* BIAS	= 1*		
* RETURN	= 2*		


```

1  BLOCK DATA
2  IMPLICIT REAL (A-H,O-Z,M)
3  LOGICAL LIST1,STATIC
4  COMMON/BLK004/ DTR,DTE,MC(30),AL,AK(15),CK(10),PCRT,ARETB,ARETE, BATES
1  SIBNL,SIBT,ETABT,DHT,WPRY,DPR,DPE,AHALFE,CLAME,QATE,WTNF,WPF, BATES
2  UK(10),PAMBT,PEXBT,PEXIT
5  COMMON/BLK005/ NLEW(S,NSI,NF,NRECON,NCASES,NDISP,NCASF ALL
6  COMMON/BLK007/ SICON,PCT,ARET,PAMT,AHALF1,W02,PCAVE COSI
7  COMMON/BLK008/ ATB(50),AFSRM(50), MPNOM,TB,NMP,NTR FSCAL
8  COMMON/BLK009/ MITOT,MPTOT,SII,AMIRR(10),AMPRR(10),DELT,MPR,MIZ INERT
9  COMMON/BLK010/ NP(30)
10 COMMON/BLK011/ ETACS,TSOL SISCAL
11 COMMON/BLK013/ CSTAR,SIAE,SIDE,WDE,ETANZ,CSTAR2,SIACON,ETANZ1, OUTPUT
5  CLAM1, SIBAT,SILOVB,SILQB,SIL2PB,SIAS,SILQVE,SILQE,SIL2PE OUTPUT
12 COMMON/BLK015/ AT,ATBAR,MFIN,MFINRT,MFINIZ,MFOUTZ,MINST,MMOTI RECON
13 COMMON/BLK017/ PRAR,PFLAG,PHEAD2,PHEPT,TIMEZ,TOL1,TOL3,MVEHI, RECON
5  NOZPOS RECON
14 COMMON/BLK018/ PADJC(2) PADJ
15 COMMON/BLK021/ TSREC,TEREC,CSHAR,PNSBAR,TWEH,PITW,CSCOFF(3),LIST1,
5  STATIC
16 COMMON/BLK023/ DATA(10),NWRDS,NUNIT
17 COMMON/BLK025/ NTAPE,NPLOT,NCARD
18 COMMON/BLK026/ NIRFLG
19 COMMON/BLK027/ DISLIM(20),MITSAV,SETFLG
20 COMMON/BLK028/ALPHA,QEX,XLAMRD,SILSB,CSTAR1
21 DATA AHALF1/.2617994/
22 DATA AHALFF/.3054327/
23 DATA AK/246.62,5.406,-0.144,1.4939,0.62403,-0.0030535,-4.278E-4,
5  8.6194E-6,-4.634E-8,0.8541,0.0244,-0.00125,246.62,5.406,-0.144/
24 DATA AL/0.943/
25 DATA ALPHA/0.0/
26 DATA AMIRR/3*0.0,.15,.235,.325,.670,.770,.87,1.0/
27 DATA AMPRR/3*0.0,.09,.16,.255,.74,.85,.928,1.0/
28 DATA ARET/9.8/
29 DATA ARETB/8.82/
30 DATA ARETE/6.0/
31 DATA ATBAR/3959./
32 DATA ATB/0.0,1.0,4.8,.12,.16,.20,.24,.28,.32,.36,.40,.44,.48,.
A 52,.56,.60,.64,.68,.72,.76,.80,.84,.88,.92,.96,.100,.104,.106,.
B 108,.112,.116,.120,.124,.128,.132,.136,.140,.150,.200,.10*0.0/
33 DATA AFSRM/0.0,2969184.,3059184.,3199184.,3299184.,3389184.,
1 3459184.,3549184.,3649184.,3839184.,3849184.,3929184.,3859184.,
2 3799184.,3749184.,3699184.,3649184.,3559184.,3489184.,3439184.,
3 5*3439184.,3419184.,3409184.,3379184.,3359184.,3409184.,
4 3199184.,2569184.,1149184.,679184.,559184.,529184.,479184.,
5 459184.,12*0.0/
34 DATA CK/32.174,14.696,778.0,3.14159/
35 DATA CLAME/0.0/
36 DATA CSBAR/4800./
37 DATA CSCOFF/4735.23,0.09546955,-0.359902E-04/
38 DATA CSTAR/4794.71/
39 DATA CSTAR1/5144.0/
40 DATA DISLIM/20*0.0/
41 DATA DPH/0.0/
42 DATA DPE/0.0/

```

43 DATA DTB/1.926/
44 DATA DTE/71.0/
45 DATA ETART/0.0/
46 DATA ETACS/0.994/
47 DATA LIST1/.FALSE./
48 DATA MC/0.0001718,5184.0,8.82,1000.0,0.01/,5144.0,5144.,-1.0,
\$ 2.9587,2.9583,4*0.0,68.2,7*0.0,4886.0,200./
49 DATA MINST/5.0E+4/
50 DATA MITOT/15081.0/
51 DATA MMOTI/2.0E+6/
52 DATA MPNOM/1676366.0/
53 DATA MPTOT/1676366.0/
54 DATA MVEHI/5.0E+6/
55 DATA NCARD/0/
56 DATA NIBFLG/0/
57 DATA NO2POS/0/
58 DATA NP/40.4,7*0.10/
59 DATA NPLOT/0/
60 DATA NTAPE/0/
61 DATA NUNIT/11/
62 DATA NWRDS/10/
63 DATA OK/J*1.0,100.,6./
64 DATA PAOJC/0.0,0.0/
65 DATA PAMBT/14.696/
66 DATA PAMT/14.7/
67 DATA PBAR/1000./
68 DATA PCAVE/494.0/
69 DATA PCHI/1000.0/
70 DATA PCT/494./
71 DATA PFLAG/0.0/
72 DATA PHEPI/100./
73 DATA PIW/1.0E+6/
74 DATA QAIE/1450.0/
75 DATA QBT/4200.0/
76 DATA QFX/0.0/
77 DATA SIGT/0.0/
78 DATA SICON/241.0/
79 DATA SII/190.0/
80 DATA SILSB/1.0/
81 DATA STAT1C/.TRUE./
82 DATA TERECH/1000./
83 DATA TSOL/0.050/
84 DATA TSREC/0.0/
85 DATA TWER/1000./
86 DATA WD2/10.0/
87 DATA WINE/15081.0/
88 DATA WPBT/49.83/
89 DATA WPE/1676366.0/
90 DATA XLAMB0/1.0/
91 END

SYMBOL	-----	REFERENCES	-----
AFSRM	- 7C0	33DA	
AHALFE	- 4C0	22DA	
AHALF1	- 6C0	21DA	
AK	- 4C0	23DA	
AL	- 4C0	24DA	
ALPHA	- 20C0	25DA	
AMIRK	- 8C0	26DA	
AMPRK	- 8C0	27DA	
ARET	- 6C0	28DA	
ARETB	- 4C0	29DA	
ARETE	- 4C0	30DA	
AT	- 12C0		
ATH	- 7C0	32DA	
ATHAK	- 12C0	31DA	
* BLKDATA	- 1*		
* BLK004	- 4*		
* BLK005	- 5*		
* BLK007	- 6*		
* BLK008	- 7*		
* BLK009	- 8*		
* BLK010	- 9*		
* BLK011	- 10*		
* BLK013	- 11*		
* BLK015	- 12*		
* BLK017	- 13*		
* BLK018	- 14*		
* BLK021	- 15*		
* BLK023	- 16*		
* BLK025	- 17*		
* BLK026	- 18*		
* BLK027	- 19*		
* BLK028	- 20*		
CK	- 4C0	34DA	
CLAME	- 4C0	35DA	
CLAM1	- 11C0		
CSHAR	- 15C0	36DA	
CSCDEF	- 15C0	37DA	
CSTAR	- 11C0	38DA	
CSTAR1	- 20C0	39DA	
CSTAR2	- 11C0		
DATA	- 16C0		
DELT	- 8C0		
DISLIM	- 19C0	40DA	
DPH	- 4C0	41DA	
DPE	- 4C0	42DA	
DTB	- 4C0	43DA	
DTE	- 4C0	44DA	
ETAHT	- 4C0	45DA	
ETACS	- 10C0	46DA	
ETANZ	- 11C0		
ETANZ1	- 11C0		
LIST1	- 3LG	15C0	47DA
MC	- 4C0	48DA	

I N D E X

BLOCK DATA

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MFIN	12C0	
MFINRT	12C0	
MFINTZ	12C0	
MFOU12	12C0	
MINST	12C0	49DA
MITOT	8C0	50DA
MITSAV	19C0	
MIZ	8C0	
MMOTI	12C0	51DA
MPNOM	7C0	52DA
MPR	8C0	
MPTOT	8C0	53DA
MVEHI	13C0	54DA
NCARD	17C0	55DA
NCASE	5C0	
NCASES	5C0	
NDISP	5C0	
NF	5C0	
NIBFLG	18C0	56DA
NLEWIS	5C0	
NMP	7C0	
NOZPOS	13C0	57DA
NP	9C0	58DA
NPLOT	17C0	59DA
NRECON	5C0	
NSI	5C0	
NTAPE	17C0	60DA
NTB	7C0	
NUNIT	16C0	61DA
NWRDS	16C0	62DA
OK	4C0	63DA
PADJC	14C0	64DA
PAMHT	4C0	65DA
PAMT	6C0	66DA
PBAR	13C0	67DA
PCAVE	6C0	68DA
PCHT	4C0	69DA
PCT	6C0	70DA
PEXHT	4C0	
PEXIT	4C0	
PFLAG	13C0	71DA
PHEAD7	13C0	
PHEPI	13C0	72DA
PITW	15C0	73DA
PNSBAR	15C0	
QAIE	4C0	74DA
QBT	4C0	75DA
QEX	20C0	76DA
SETFLG	19C0	
SIACON	11C0	
SIAF	11C0	
SIAS	11C0	
SIRAT	11C0	
SIBNL	4C0	
SIBT	4C0	77DA

I N D E X

BLOCK DATA

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SICON	-	600	780A	
SIDE	-	1100		
SII	-	800	790A	
SILDVH	-	1100		
SILDVF	-	1100		
SILQ8	-	1100		
SILQF	-	1100		
SILSB	-	2000	800A	
SIL2PB	-	1100		
SIL2PF	-	1100		
STATIC	-	3LG	1500	810A
TR	-	700		
TEHFC	-	1500	820A	
TIMEZ	-	1300		
TOL1	-	1300		
TOL3	-	1300		
TSOL	-	1000	830A	
TSRFC	-	1500	840A	
TWEH	-	1500	850A	
WDE	-	1100		
WDZ	-	600	860A	
WINE	-	400	870A	
WPHT	-	400	880A	
WPE	-	400	890A	
XLAMBD	-	2000	900A	

```

1  SUBROUTINE BATES
2  REAL*4 MC
3  LOGICAL ERR
4  LOGICAL LIST1,STATIC
5  REAL*8 RTOTOF,RTOIVF,RTOIVT
6  REAL*8 TSTAGK,TEXITK,CHEN,EXEN,PROP,WTMOLG,CUGO,PARWT,RCH,SLOP1,
   A SLOP2,RARC1,RARC2,ARF
7  DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS
8  COMMON/POINTS/HSUM,SSUM,CPR(13),DLVTP(13),DLVPT(13),
   1 GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13)
   2 VLM(13),TOTM(13)
9  COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VACI(13),SUBAR(13),SUPAR(13)
   1 APP(13),AEAT(13),CSTR,FQL,FROZ,SSO,AREA,AWT
10  COMMON/BLK001/IRKT01,IRKT02,ERR,IN
11  COMMON/BLK002/ SILOPT(18),SILVAC(18),ACSTRY(18),APEXT(18)
12  COMMON/BLK004/ DTR,DTE,MC(30),AL,AK(15),CK(10),PCBT,ARFTB,ARETE, BATES
   1 SIBNL,SIBT,ETABT,GBT,WPRT,DPB,DPE,AHALFE,CLAME,GAIE,WINE,WPF,
   2 OK(10),PAMBT,PEXRT,PEXIT
13  COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE ALL
14  COMMON/BLK006/RTOTOF,RTOIVF,RTOIVT
15  COMMON/BLK013/ CSTAR,SIAE,SIDE,WD1,ETANZ,CSTAR2,SIACON,ETANZ2, OUTPUT
   $ CLAME2,SIRAT,SILOVR,SILQ8,SIL2PB,SIAS,SILUVE,SILQE,SIL2PE OUTPUT
16  COMMON/BLK021/TSREC,TEREC,CSBAR,PNSBAR,TWEB,PITW,CSCOFF(3),LIST1,
   $ STATIC
17  COMMON/BLK028/ALPHA,QEX,XLAMRD,SILSB,CSTAR1
18  COMMON/COM01/TSTAGK,TEXITK,CHEN,EXEN,PROP,WTMOLG,CUGO,
   1 PARWT,RCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,IDBUG,IDNPRT
19  DIMENSION ACSSAV(18)
20 10 CALL ITIDNZ
21  IF(ERR) RETURN
22  IF(SIBNL.GT.0.0) GO TO 70
23  IF(NLEWIS.GT.0) GO TO 20
24  SIRAT = AK(1)*AK(2)*ARETB*AK(3)*ARFTB**2-ARETB*MC(2)*PAMBT
   $/(PCBT*CK(1))
25  SIAS = AK(1)*AK(2)*MC(3)+AK(3)*MC(3)**2-MC(6)*MC(3)*CK(2)/
   $ (MC(4)*CK(1))
26  SIAE = AK(1)*AK(2)*ARETE*AK(3)*ARETE**2
27  SIJ=MC(24)
28  GO TO 30
29 20 CALL LEWIT
30  P(1)= PCBT
31  P(2)= MC(4)
32  P(3)= 500.
33  P(4)= 700.
34  PCP(1)= MC(15)
35  SUPAR(1)= ARETH
36  SUPAR(2)= ARETF
37  SUPAR(3)=1.0
38  CALL LEWIS
39  IF(EPR) RETURN
40  SIRAT = SILOPT(2)
41  SIAS = SILOPT(5)
42  SIAE = SILVAC(7)
43  CSTAR1= ACSTRY(5)
44  SIJ=SILVAC(8)

```

```

45 30 IF(SIHT.GT.0.0) GO TO 40
46 SIHT = ETART*SIAS
47 GO TO 50
48 40 SIHT = SIHT * SIAS/SIHTAT
49 50 SILOVB = SIAS*MC(5)
50 SI1 = ((SIHT+SILOVB)**2+2.0*CK(3)*QRT/(CK(1)*WPBT))**0.5
51 SILOB = SI1-SILOVB-SIHT
52 IF(DPB.GT.0.0) GO TO 60
53 DPB = AK(4)+AK(5)*DTR*AK(6)*DTH**2+AK(7)*DTH**3+AK(8)*DTR**4 +
$ AK(9)*DTH**5
54 60 RTH = DTH/24.0
55 RCH = 4.*RTH
56 SLOP1=1.0
57 SLOP2=0.2679
58 RARC1= 0.25
59 RARC2= 0.25
60 ARF = MC(3)
61 XP = .294932*AL
62 XG = 1.0-XP
63 RP = 0.5*DPB
64 CALL IDNOZL(RTH,RP,XP,XG)
65 RT011=RT010F
66 SIL2PB = SIAS*(1.-RT011)
67 SIHNL = SIHT + SILOVB + SILOB + SIL2PB
68 GO TO 90
69 70 IF(NLEWIS.GT.0) GO TO 80
70 SIAE = AK(1)+AK(2)*ARETE+AK(3)*ARETE**2
71 SIA5 = AK(1)+AK(2)*MC(3)+AK(3)*MC(3)**2-MC(6)*MC(3)*CK(2)/
$ (MC(4)*CK(1))
72 SI3=MC(24)
73 GO TO 90
74 80 CALL LEWIT
75 P(1)= MC(4)
76 P(2)=500.
77 P(3)=700.
78 P(4)=900.
79 PCP(1)=MC(15)
80 SUPAR(1)=1.0
81 SUPAR(2)=ARETE
82 CALL LEWIS
83 IF(ERR) RETURN
84 CSTAR1 = ACSTHT(1)
85 SIAS = SILOPT(1)
86 SI3 =SILVAC(2)
87 SIAE=SILVAC(3)
88 90 IF(DPE.GT.0.0) GO TO 100
89 DPE = AK(4)+AK(5)*DTE*AK(6)*DTE**2+AK(7)*DTE**3+AK(8)*DTE**4 +
$ AK(9)*DTE**5
90 100 RTH = DTE/24.0
91 RCH = 3.65352*RTH
92 SLOP1 = MC(8)
93 SLOP2 = TAN(AHALFE)
94 RARC1 = MC(9)
95 RARC2 = MC(10)
96 ARF = ARETE

```

```

97      XP = .294932*AL
98      XG = 1.0-XP
99      RP = OPE/2.0
100     CALL IDNOZL (RTH,RP,XP,XG)
101     RT012=RT01VF
102     RT013=RT01VT
103     SIENL = SIENL*SIAE/SIAS
104     C METHOD OF CHARACTERISTICS CORRECTION END ITEM MOTOR
105     IF (ALPHA.GT.0.0 .AND. QEX.GT.0.0 .AND. XLAMB.D.EQ.1.0) GO TO 105
106     SIL2PE = SIAE*(1. - RT012)
107     GO TO 106
108     105 SIL2PE=SIAP*(1.-(RT012*((0.5-0.5*COS(ALPHA))/(0.5-0.5*COS((ALPHA-
109     S QEX)/2.)))*XLAMB.D))
110     SI2 = ((SIENL-SIL2PE)**2-QATE*WINE**2*CK(13)*(WPE*CK(1)))*0.5
111     SILQE = SIENL-SIL2PE-SI2
112     C APPROXIMATE CORRECTION END ITEM MOTOR
113     IF (ALPHA.GT.0.0 .AND. QEX.GT.0.0 .AND. XLAMB.D.EQ.1.0) GO TO 115
114     IF (ALPHA.GT.0.0 .AND. QEX.GT.0.0) GO TO 117
115     C DIVERGENCE LOSS CORRECTION END ITEM MOTOR
116     IF (CLAME.GT.0.0) GO TO 110
117     SILOVE = SIAE*(0.5-0.5*COS(ALHALFE))
118     GO TO 120
119     110 SILOVE = SIAE*(1.0-CLAME)
120     GO TO 120
121     115 SILOVE=SIAP*(0.5-0.5*COS((ALPHA+QEX)/2.0))
122     GO TO 120
123     117 SILOVE = SIAE*(0.5-0.5*COS(ALPHA))*XLAMB.D
124     SILOE = (SIENL-SIL2PE-SILOVE)*SILSB
125     CSTAR=OK(1)*CSTAR1*((SIENL-(1.0-RT013)*S13-SILOE)*S1LSH/SIAE
126     C
127     C FORCE THEORETICAL CSTAR CURVE FIT THROUGH END ITEM CALCULATED CSTAR
128     IF (INLEWIS.GT.0) GO TO 140
129     130 CSCOE(1) = CSTAR - CSCOE(2)*MC(4) - CSCOE(3)*(MC(4)**2)
130     CALL OUTPUT
131     RETURN
132     140 DO 150 I=1,10
133     ICOUNT = I
134     IF (ACSTRT(I).NE.ACSTRT(I+1)) GO TO 160
135     150 CONTINUE
136     160 ICNT=0
137     IPC=1
138     DO 165 I=1,18
139     IF (P(I).NE.P(I+1)) GO TO 168
140     IF (P(I).NE.0.0) IPC=IPC+1
141     165 CONTINUE
142     ICOUNT = ICOUNT/IPC
143     DO 170 I=1,18*ICOUNT
144     ICNT = ICNT + 1
145     170 ACSSAV(ICNT) = ACSTRT(I)
146     DO 180 I=1,18
147     ICNT=I
148     PTI=P(I)*14.696
149     IF (P(I).GT.0.0) GO TO 180
150     GO TO 190

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I N D E X

SUBROUTINE RATES

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```
145. 180 CONTINUE
146 190 ICNT = ICNT - 1
147   CALL LESSQ(P,ACSSAV,ICNT,CSCDEF)
148   GO TO 130
149   END
```

72. 14

SYMBOL	REFERENCE
10	20*
20	23 29*
30	28 45*
40	45 48*
50	47 49*
60	52 54*
70	22 69*
80	69 74*
90	68 73 88*
100	88 90*
105	104 107*
106	106 108*
110	112 115*
115	110 117*
117	111 119*
120	114 116 118 120*
130	123* 148
140	122 125*
150	12600 129*
160	128 130*
165	13200 135*
168	133 136*
170	13700 139*
180	14000 143 145*
190	144 146*
ACSSAV	19DI 139* 147AG
ACSTR1	11CO 43 84 128 139
AEAT	9CO
AMALFE	12CO 93 113
AK	12CO 24 25 26 53 70 71 89
AL	12CO 61 97
ALPHA	17CO 104 107 110 111 117 119
APEXT	11CO
APP	9CO
AREA	9CO
ARETB	12CO 24 35
ARETE	12CO 24 36 70 81 96
ARF	6RL 18CO 60* 96*
AWT	9CO
* BATES	1*
* BLK001	10*
* BLK002	11*
* BLK004	12*
* BLK005	13*
* BLK006	14*
* BLK013	15*
* BLK021	16*
* BLK028	17*
CHFN	6RL 18CO
CK	17CO 24 25 50 71 108
CLAME	12CO 112 115
CLAMEP	15CO
* COM01	18*

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* TAN	-	93					
TEREC	-	16C0					
TEXTIK	-	6RL	18C0				
TOTM	-	8C0					
TSREC	-	16C0					
TSTAGK	-	6RL	18C0				
ITT	-	8C0					
TWER	-	16C0					
V	-	8C0					
VACI	-	9C0					
VLM	-	8C0					
VMOC	-	9C0					
WDI	-	15C0					
WINF	-	12C0	10B				
WM	-	8C0					
WPBT	-	12C0	50				
wPE	-	12C0	10B				
WTMOLG	-	6RL	18C0				
XG	-	62=	64AG	98=	100AG		
XLAMB0	-	17C0	104	107	110	119	
XP	-	61=	62	64AG	97=	98	100AG

```

1 SUBROUTINE CDSI
2 C----- CONTRACTOR DATA SPECIFIC IMPULSE SCALING (HARRIS)
3 LOGICAL ERR
4 LOGICAL LIST1,STATIC
5 REAL*4 MC
6 COMMON/BLK001/IRKT01,IRKT02,ERR,IN
7 COMMON/BLK002/ SILOPT(18),SILVAC(18),ACSTRT(18),APEXT(18)
8 COMMON/BLK004/ DTR,DTE,MCT(30),AL,AK(15),CK(10),PCBT,ARETA,ARETE, BATES
9 1 SIBNL,SIBT,ETART,QRT,WPBT,DPB,DPE,AHALFE,CLAME,GAIE,WINE,WPE.
10 2 OK(10),PAMBT,PEXRT,PEXIT
11 COMMON/BLK005/ NLEWTS,NSI,NF,NRECON,NCASES,NDISP,NCASE ALL
12 COMMON/BLK007/ STCON,PCT,ARET,PAMT,AHALF1,WD2,PCAVE
13 COMMON/BLK013/ CSTAR,SIAE,SIDE,WDE,ETANZ,CSTAR2,SIACON,ETANZ1, OUTPUT
14 5 CLAM1, SIRAT,SILDVB,SILQB,SIL2PB,SIAS,SILQVE,SILQE,SIL2PE OUTPUT
15 COMMON/BLK021/ TSREC,TEREC,CSBAR,PNSBAR,TWEB,PIW,CSCOE(3),LIST1,
16 5 STATIC
17 COMMON/BLK028/ALPHA,DEX,XLAMBD,SILSB,CSTAR1
18 DOUBLE PRECISION HSUM,SSUM,CPR,OLVTP,OLVPT,GAMMAS
19 COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),OLVTP(13),OLVPT(13),
20 1 GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13)
21 2 ,VLM(13),TOTM(13)
22 COMMON/PERF/PCP(22),VMOC(13),SPIN(13),VAC1(13),SUBAR(13),SUPAR(13)
23 1 ,APP(13),AEAT(13),CSTR,FOL,FROZ,SS0,AREA,AWT
24 DIMENSION ACSSAV(18)
25 IF(NLEWIS.GT.0) GO TO 10
26 SIACON=AK(13)*AK(14)*ARET + AK(15)*ARET**2 -ARET*MC(23)*PAMT
27 S/(PCT*CK(1))
28 SIAE = AK(1)* AK(2)*ARETE + AK(3)*ARETE**2
29 GO TO 20
30 10 CALL LEWIT
31 P(1) = PCT
32 P(2) = PCAVE
33 P(3) = 500.
34 P(4) = 700.
35 P(5) = 900.
36 SUPAR(1)= ARET
37 SUPAR(2)= ARETE
38 CALL LEWIS
39 SIACON = SILVAC(1)-ARET*MC(23)*PAMT/(PCT*CK(1))
40 SIAE = SILVAC(4)
41 WDE = PCAVE*OTE**2*CK(4)*CK(1)/(4.0*MC(23))
42 ALDE = ALOG(WDE)
43 ALD2 = ALOG(WD2)
44 ETANZ = (AK(10)+AK(11))*ALDE+AK(12)*ALDE**2)*SILSB
45 ETANZ1= AK(10)+AK(11)*ALD2+ AK(12)*ALD2**2
46 C INPUT DIVERGENCE LOSS CORRECTION END ITEM MOTOR
47 IF(CLAME.GT.0.0) GO TO 30
48 CLAME = 0.5 + 0.5*COS(AHALFE)
49 C APPROXIMATE CORRECTION END ITEM MOTOR
50 IF(ALPHA.GT.0.0 .AND. DEX.GT.0.0 .AND. XLAMBD.EQ.1.0)
51 5 CLAME= 0.5+0.5*COS((ALPHA+DEX)/2.0)
52 C METHOD OF CHARACTERISTICS CORRECTION END ITEM MOTOR
53 IF(ALPHA.GT.0.0 .AND. DEX.GT.0.0 .AND. XLAMBD.NF.1.0 )
54 5 CLAME= 10.5+0.5*COS(ALPHA)*XLAMBD
55 30 CLAM1 = 0.5 + 0.5*COS(AHALF1)

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```

42      SIDE = SICON*(SIAE/SIACON)*(CLAME/CLAM1)*OK(2)*(ETANZ/ETANZ1)
43      CSTAR = MC(23)*OK(2)*ETANZ/ETANZ1
      C
      C   FORCE THEORETICAL CSTAR CURVE FIT THROUGH END ITEM CALCULATED CSTAR
      C
44      IF(NLEWIS.GT.0) GO TO 140
45      130 CSCOEFF(1)= CSTAR - CSCOEFF(2)*PCAVE - CSCOEFF(3)*(PCAVE**2)
46      CALL OUTPUT
47      RETURN
48      140 DO 150 I=1,18
49          ICOUNT = 1
50          IF(ACSTRT(I).NE.ACSTRT(I+1)) GO TO 160
51      150 CONTINUE
52      160 ICNT=0
53          IPC=1
54          DO 165 I=1,18
55              IF(P(I).NE.P(I+1)) GO TO 168
56              IF(P(I).NE.0.0) IPC=IPC+1
57      165 CONTINUE
58      168 ICOUNT = ICOUNT/IPC
59          DO 170 I=1,18,ICOUNT
60              ICNT = ICNT + 1
61      170 ACSSAV(ICNT) = ACSTRT(I)
62          DO 180 I=1,18
63              ICNT=I
64              P(I)=P(I)*14.696
65              IF(P(I).GT.0.0) GO TO 180
66          GO TO 190
67      180 CONTINUE
68      190 ICNT = ICNT - 1
69          CALL LESSQ(P,ACSSAV,ICNT,CSCOEFF)
70          GO TO 130
71      END

```

SYMBOL	-----	REFERENCES	-----
10	- 17	21*	
20	- 20	32*	
30	- 37	41*	
130	- 45*	70	
140	- 44	48*	
150	- 4800	51*	
160	- 50	52*	
165	- 5400	57*	
168	- 55	58*	
170	- 5900	61*	
180	- 6200	65	67*
190	- 66	68*	
ACSSAV	- 160I	61=	69AG
ACSTRT	- 6C0	50	61
AFAT	- 15C0		
AHALFE	- 7C0	38	
AHALF1	- 9C0	41	
AK	- 7C0	18	19 35 36
AL	- 7C0		
ALDF	- 33=	35	
ALD2	- 34=	36	
* ALUG	- 33	34	
ALPHA	- 12C0	39	40
APEXT	- 6C0		
APP	- 15C0		
AREA	- 15C0		
ARET	- 9C0	18	27 30
ARETB	- 7C0		
ARETE	- 7C0	19	28
AWT	- 15C0		
* BLK001	- 5*		
* BLK002	- 6*		
* BLK004	- 7*		
* BLK005	- 8*		
* BLK007	- 9*		
* BLK013	- 10*		
* BLK021	- 11*		
* BLK028	- 12*		
* COSI	- 1*		
CK	- 7C0	18	30 32
CLARE	- 7C0	37	38= 39= 40= 42
CLAM1	- 10C0	41=	42
* CUS	- 38	39	40 41
CPR	- 1308	14C0	
CSBAR	- 11C0		
CSCOFF	- 11C0	45=	69AG
CSTAR	- 10C0	43=	45
CSTAR1	- 12C0		
CSTAR2	- 10C0		
CSTR	- 15C0		
ULVPT	- 1308	14C0	
ULVTP	- 1308	14C0	
DPH	- 7C0		

	DPE	-	7CO																	
	DTR	-	7CO																	
	DTE	-	7CO	32																
	EQL	-	15CO																	
	ERR	-	2LG	5CO																
	ETAHT	-	7CO																	
	ETANZ	-	10CO	35=	42	43														
	ETANZ1	-	10CO	36=	42	43														
	FRO7	-	15CO																	
	GAMMAS	-	130H	14CO																
	HSUM	-	130H	14CO																
	I	-	4800	49	50	5400	55	56	5900	61	6200	63	64	65						
	ICNT	-	52=	60=	61	63=	68=	69AG												
	ICOUNT	-	49=	58=	5900															
	IN	-	5CO																	
	IPC	-	53=	56=	58															
	IRKT01	-	5CO																	
	IRKT02	-	5CO																	
*	LESSQ	-	69*																	
*	LEWIS	-	29*																	
*	LEWIT	-	21*																	
	LIST1	-	3LG	11CO																
	MC	-	4RL	7CO	18	30	32	43												
	NCASE	-	8CO																	
	NCASES	-	8CO																	
	NDISP	-	8CO																	
	NF	-	8CO																	
	NLEWIS	-	8CO	17	44															
	NRECON	-	8CO																	
	NSI	-	8CO																	
	OK	-	7CO	42	43															
*	OUTPUT	-	46*																	
	P	-	14CO	22=	23=	24=	25=	26=	55	56	64=	65	69AG							
	PAMBT	-	7CO																	
	PAMT	-	9CO	18	30															
	PCAVE	-	9CO	23	32	45														
	PCBT	-	7CO																	
	PCP	-	15CO																	
	PCT	-	9CO	18	22	30														
*	PERF	-	15*																	
	PEXBT	-	7CO																	
	PEXIT	-	7CO																	
	PITW	-	11CO																	
	PNSRAR	-	11CO																	
*	POINTS	-	14*																	
	PPP	-	14CO																	
	QAIE	-	7CO																	
	QHT	-	7CO																	
	QEX	-	12CO	39	40															
*	RETURN	-	47*																	
	SIACON	-	10CO	18=	30=	42														
	SIAE	-	10CO	19=	31=	42														
	SIAS	-	10CO																	
	SIBAT	-	10CO																	
	SIBNL	-	7CO																	

I N D E X

SUBROUTINE COSI

SIHT	-	700		
SICON	-	900	42	
SIDF	-	1000	42=	
SILDVB	-	1000		
SILDVF	-	1000		
SILOPT	-	600		
SILQB	-	1000		
SILQE	-	1000		
SILSB	-	1200	35	
SILVAC	-	600	30	31
SIL2PP	-	1000		
SIL2PF	-	1000		
SONVEL	-	1400		
SPIM	-	1500		
SSUM	-	1300	1400	
SSO	-	1500		
STATIC	-	316	1100	
SUHAH	-	1500		
SUPAR	-	1500	27=	28=
T	-	1400		
TERFC	-	1100		
TOTM	-	1400		
TSREC	-	1100		
TTT	-	1400		
TJEH	-	1100		
V	-	1400		
VACI	-	1500		
VLM	-	1400		
VMDG	-	1500		
WDE	-	1000	32=	33
WDZ	-	900	34	
WINE	-	700		
WM	-	1400		
WPUT	-	700		
WPE	-	700		
XLAMHD	-	1200	39	40

INDEX

SUBROUTINE CONT

1		SUBROUTINE CONT
	C	THIS ROUTINE ADJUSTS THRUST TO CASE CENTERLINE AND MUST BE
2	C	TAILORED FOR THE PARTICULAR CONTROL SYSTEM BEING RECONSTRUCTED
3		RETURN
		END

INDEX

SUBROUTINE CONT

PAGE 24

SYMBOL		REFERENCES	
#	CONT -	1*	
#	RETURN -	2*	

```
1      SUBROUTINE DATLOC(NAME)
2      COMMON/BLK001/IRKT01,IRKT02,ERR,IN
3      LOGICAL ERR
4      REAL*8 NAME,A(10)
5      ERR = .FALSE.
6      REWIND IN
7      10 READ(IN,20,END=30) (A(I),I=1,10)
8      20 FORMAT(10A8)
9      IF (A(1).EQ.NAME) RETURN
10     GO TO 10
11     30 WRITE(6,40) NAME
12     40 FORMAT('0NO *A8,* DATA CARDS FOUND - GOING TO NEXT CASE')
13     ERR = .TRUE.
14     RETURN
15     END
```

SYMBOL	-----	REFERENCES	-----
10	-	7*	10
20	-	7RD	8*
30	-	7RD	11*
40	-	11WR	12*
A	-	4RL	7RD
* BLK001	-	2*	9
* DATLOC	-	1*	
ERR	-	2C0	3LG 5= 13=
I	-	7RD	
IN	-	2C0	6 7RD
IRK101	-	2C0	
IRK102	-	2C0	
NAME	-	1AG	4RL 9 11WR
* RETURN	-	9*	14*

```

1      SUBROUTINE DISP
2      IMPLICIT REAL (A-H,O-Z,M)

      C
      C      DISPERSION MODULE (RICHARDS)    5-10-74
      C

3      LOGICAL LIST1,STATIC
4      COMMON/BLK005/ MLEWIS,NS1,NF,NRECON,NCASES,NDISP,NCASE
5      COMMON/BLK008/ ATB(50),AFSRM(50), MPNUM,TB,NMP,NTR
6      COMMON/BLK009/ MITOT,MPTOT,STI,AMIRR(10),AMPRR(10),DELT,MPP,MIZ
7      COMMON/BLK021/ TSRFC,TEREC,CSBAR,PNSBAR,TWEB,PITW,CSCOEFF(3),LIST1,
      $ STATIC
8      COMMON/BLK027/ DISLIN(20),MITSAV,SETFLG
9      DIMENSION GEOCON(45,18)
10     DIMENSION AINCIN(18),ALA(18),ALB(18),ALE(18),ALS1(18),ALS2(18),
1     A01(18),A02(18),A03(18),A04(18),A05(18),RF(18),R2(18),R3(18),
2     R4(18),R5(18),R6(18),R7(18),R8(18),TAUW(18), THO(18),
3     SA(18),SB(18), AKG(5),AKR(39),AKSLOT(2),AKU(5),AMWG(20),
4     CKDUMP(80),CSTR(20),GAMAG(20),KDUMP(72),ICOMB(20),
5     DTAU(18),DTAUW(18),ANO(18),TSLVR(18),SLTDWN(18),PHST(70),
6     TIMEPH(70),TAUAKR(30),AKRTAU(30),PRESS(20),TIMEPS(50),EPCA(50),
7     EPCN(50),ACCELT(50),TIMEAC(50),TIMEDT(25),TOELDT(25)
11     DIMENSION
     APORT(18),TAUHD(50),ABHD(50),PMOHD(50),RMOHD
     S(50),XCGHD(50),TAUN(50),ABN(50),PMOIN(50),RMOIN(50),XCGN(50),TAUPL
     S(50,18),ALPPL(50,18),AKGYP(50,18)
12     DIMENSION TBLAKR(25),TIMAKR(25)
13     DIMENSION TBLCM(50),TIMECM(50),NGEO(18)
14     INTEGER SETFLG
15     NAMELIST/IRDATA/
     SHCO,AINCIN,SA,SB,DELZ,ANO,RF,ALS1,ALS2,TAUW,A01,A02,A03,A04,A05,R2
     S,R3,R4,R5,R6,R7,R8,ALA,ALB,ALE,THO,TSLVR,DTAU,DTAUW,BH,DH1,AOHM,
     SHTAOE,RIG,AK,DRVRF,AKK,BN,DNI,AONM,DLEF,
     $ AKG,HHR,AKU,AKR,AKSLOT,SLTDWN,NPH, AINCPL,RHFLAG,AKRH,AKRN,
     $ PHST,TIMEPH,NAKRST,TAUAKR,AKRTAU,GAMA,R,DELF,CSTAR,TO,NCSTR,PRFSS,
     $ NAKR,TIMAKR,TBLAKR,NAKEND,NTAUTO,
     $ TCOMR,AMWG,GAMAG,CSTR,NCSCOE,
     $ SETFLAG,STDYST,DELTST,DELTSS,DELTTO,TIMAX,IST,PST,AITST,ANITW,
     $ TIMPT1,TIMPT2,DELTSP,
     $ ANZ,CM,DE,DT,ANN,PA,NDT,TIMEDT,TOELDT,NPA,TIMEPA,TB1PA,
     $ ERBAR,EREXP,PONPAR,
     $ NCM,TBLCM,TIMECM,
     $ NKRAB,MPUTAB,KPLANE,VCHINP,VCHINP,VFHO,VFNO,NGFOHD,NGEOMN,
     $ APORT,TAUHD,ABHD,PMOHD,RMOHD,XCGHD,TAUN,ABN,PMOIN,RMOIN,
     $ XCGN,TAUPL,ALPPL,AKGYP,GEOCON,NGEO,
     $ PRIFLG,KMOICG,PHI,CRP,CRT,CRW,NEPS,PCTAB,TIMEPS,FPCA,EPCN,NACCFL,
     $ SACCELT,TIMEAC,CKDUMP,KDUMP,WFACT,RHOTOL,WFTOL,GFORUM
     NAMELIST/IDISP/DELF,AKR,AKSLOT,ERBAR,CSTAR,CSTR,DT,DE
16     REWIND 25
17
18     NIBOUT=20
19     IF(NCASE.EQ.0) SETFLG=0
20     IF(NCASE.EQ.0) MITSAV=MITOT
21     IF(NF.EQ.0) GO TO 10
      C
22     *** INITIALIZE VARIABLES
23     DELF=0.0
24     DO 2 I=1,39
2     AKR(I)=0.0

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25 AKSLOT(1)=0.0
26 AKSLOT(2)=0.0
27 CSTAR=0.0
28 DO 5 I=1,20
29 5 CSTAR(I)=0.0
30 DT=0.0
31 DE=0.0
32 ERBAR=0.0
33 WFACT=0.0
34 REWIND NIBOUT
35 READ(NIBOUT,IBDATA)
36 10 CALL OUTPUT
37 IF(SFTFLG.LE.0) GO TO 15
38 MITOT=MITSAV
39 SETFLG=0
40 15 GO TO (20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,
    $ 180,190,200,210,220,230),NDISP
    C *** + PROPELLANT DENSITY (NDISP=1)
41 20 CONTINUE
42 DELF=DELF*(ABS(DISLIM(1))+1.)
43 WRITE(6,25) DELF
44 25 FORMAT('0',T4,'DELF = ',E15.8)
45 GO TO 1000
    C *** - PROPELLANT DENSITY (NDISP=2)
46 30 DELF=DELF*(1.-ABS(DISLIM(1)))
47 WRITE(6,25) DELF
48 GO TO 1000
    C *** + PRESSURE EXPONENT (NDISP=3)
49 40 AKR(3)=AKR(3)*(ABS(DISLIM(2))+1.)
50 AKR(37)=AKR(37)*(ABS(DISLIM(2))+1.)
51 AKSLOT(2)=AKSLOT(2)*(ABS(DISLIM(2))+1.)
52 WRITE(6,45) AKR(3),AKR(37),AKSLOT(2)
53 45 FORMAT('0',T4,'AKR(3) = ',E15.8/T4,'AKR(37) = ',E15.8/T4,'AKSLOT(2)
    $ = ',E15.8)
54 GO TO 1000
    C *** - PRESSURE EXPONENT (NDISP=4)
55 50 AKR(3)=AKR(3)*(1.-ABS(DISLIM(2)))
56 AKR(37)=AKR(37)*(1.-ABS(DISLIM(2)))
57 AKSLOT(2)=AKSLOT(2)*(1.-ABS(DISLIM(2)))
58 WRITE(6,45) AKR(3),AKR(37),AKSLOT(2)
59 GO TO 1000
    C *** + PRESSURE COEFFICIENT (NDISP=5)
60 60 AKR(2)=AKR(2)*(DISLIM(3)+1.)
61 AKR(36)=AKR(36)*(DISLIM(3)+1.)
62 AKSLOT(1)=AKSLOT(1)*(DISLIM(3)+1.)
63 WRITE(6,65) AKR(2),AKR(36),AKSLOT(1)
64 65 FORMAT('0',T4,'AKR(2) = ',E15.8/T4,'AKR(36) = ',E15.8/T4,'AKSLOT(1)
    $ = ',E15.8)
65 GO TO 1000
    C *** - PRESSURE COEFFICIENT (NDISP=6)
66 70 AKR(2)=AKR(2)*(1.-ABS(DISLIM(3)))
67 AKR(36)=AKR(36)*(1.-ABS(DISLIM(3)))
68 AKSLOT(1)=AKSLOT(1)*(1.-ABS(DISLIM(3)))
69 WRITE(6,65) AKR(2),AKR(36),AKSLOT(1)
70 GO TO 1000

```

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```

71      C      *** + CHARACTERISTIC VELOCITY (NDISP=7)
72      80 CSCOFF(1)=CSCOFF(1)*(ABS(DISLIM(4))+1.)
73      CSTAR = CSTAR*(ABS(DISLIM(4))+1.)
74      DO 85 I=1,20
75      85 CSTR(I)=CSTR(I)*(ABS(DISLIM(4))+1.)
76      WRITE(A,88) CSCOFF(1),CSTAR,(I,CSTR(I),I=1,20)
77      88 FORMAT('0',T4,'CSCOFF(1) =',E15.8/T4,'CSTAR =',F15.8//
78      $ (T4,'CSTR(',I2,')= ',E15.8))
79      GO TO 1000
80      C      *** - CHARACTERISTIC VELOCITY (NDISP=8)
81      90 CSCOFF(1)=CSCOFF(1)*(1.-ABS(DISLIM(4)))
82      CSTAR = CSTAR*(1.-ABS(DISLIM(4)))
83      DO 95 I=1,20
84      95 CSTR(I)=CSTR(I)*(1.-ABS(DISLIM(4)))
85      WRITE(A,88) CSCOFF(1),CSTAR,(I,CSTR(I),I=1,20)
86      GO TO 1000
87      C      *** + PROPELLANT GRAIN LENGTH (NDISP=9)
88      100 CONTINUE
89      GO TO 1000
90      C      *** - PROPELLANT GRAIN LENGTH (NDISP=10)
91      110 CONTINUE
92      GO TO 1000
93      C      *** + PROPELLANT GRAIN WEB THICKNESS (NDISP=11)
94      120 CONTINUE
95      GO TO 1000
96      C      *** - PROPELLANT GRAIN WEB THICKNESS (NDISP=12)
97      130 CONTINUE
98      GO TO 1000
99      C      *** + INITIAL THROAT DIAMETER (NDISP=13)
100      140 DT=DT + DISLIM(7)
101      WRITE(A,145) DT
102      145 FORMAT('0',T4,'DT =',F15.8)
103      GO TO 1000
104      C      *** - INITIAL THROAT DIAMETER (NDISP=14)
105      150 DT=DT - DISLIM(7)
106      WRITE(A,145) DT
107      GO TO 1000
108      C      *** + INITIAL EXIT DIAMETER (NDISP=15)
109      160 DE = DE + DISLIM(8)
110      WRITE(A,165) DE
111      165 FORMAT('0',T4,'DE =',E15.8)
112      GO TO 1000
113      C      *** - INITIAL EXIT DIAMETER (NDISP=16)
114      170 DE = DE - DISLIM(8)
115      WRITE(A,165) DE
116      GO TO 1000
117      C      *** + THROAT EROSION RATE (NDISP=17)
118      180 ERBAR = ERBAR + DISLIM(9)
119      WRITE(A,185) ERBAR
120      185 FORMAT('0',T4,'ERBAR =',E15.8)
121      GO TO 1000
122      C      *** - THROAT EROSION RATE (NDISP=18)
123      190 ERBAR = ERBAR - DISLIM(9)
124      WRITE(A,185) ERBAR
125      GO TO 1000

```

```

C *** + PROPELLANT GRAIN TEMPERATURE (NDISP=19)
113 200 CONTINUE
114 GO TO 1000
C *** - PROPELLANT GRAIN TEMPERATURE (NDISP=20)
115 210 CONTINUE
116 GO TO 1000
C *** + INITIAL INERT MASS CONSUMABLE (NDISP=21)
117 220 SETFLG=1
118 MITOT = MITOT + (ARS(DISLIN(11))*MPNOM)
119 MI7=MITOT
120 WRITE(6,225) MITOT
121 225 FORMAT('0',T4,'MITOT =',E15.8)
122 GO TO 1000
C *** - INITIAL INERT MASS CONSUMABLE (NDISP=22)
123 230 SETFLG=1
124 MITOT = MITOT - (ARS(DISLIN(11))*MPNOM)
125 IF (MITOT.GE.0.0) GO TO 990
126 WRITE(6,900)
127 900 FORMAT('0 DISPERSION FOR INERT MASS IS TO GREAT, MITOT SET TO 0.0'
128 3)
128 MITOT=0.0
129 990 MI7=MITOT
130 WRITE(6,225) MITOT
131 1000 IF (NF.EQ.0) RETURN
132 WRITE(25,INDISP)
133 RETURN
134 END

```

SYMBOL	-----	REFERENCES	-----
2	-	2300 24*	
5	-	2800 29*	
10	-	21 36*	
15	-	37 40*	
20	-	40 41*	
25	-	43WR 44*	47WR
30	-	40 46*	
40	-	40 49*	
45	-	52WR 53*	58WR
50	-	40 55*	
60	-	40 60*	
65	-	63WR 64*	69WR
70	-	40 66*	
80	-	40 71*	
85	-	7300 74*	
88	-	75WR 76*	82WR
90	-	40 78*	
95	-	8000 81*	
100	-	40 84*	
110	-	40 86*	
120	-	40 89*	
130	-	40 90*	
140	-	40 92*	
145	-	93WR 94*	97WR
150	-	40 96*	
160	-	40 99*	
165	-	100WR 101*	104WR
170	-	40 103*	
180	-	40 106*	
185	-	107WR 108*	111WR
190	-	40 110*	
200	-	40 113*	
210	-	40 115*	
220	-	40 117*	
225	-	120WR 121*	130WR
230	-	40 123*	
900	-	126WR 127*	
990	-	125 129*	
1000	-	45 48	54 59 65 70 71 83 85 87 89 91 95
	-	98 102	105 109 112 114 116 122 131*
AHHD	-	110I 15NM	
AHN	-	110I 15NM	
AHS	-	42 46	49 50 51 55 56 57 66 67 68 71 72
	-	74 78	79 81 118 124
ACCFLY	-	100I 15NM	
AFSRM	-	500	
AINCIN	-	100I 15NM	
AINCPL	-	15NM	
AITST	-	15NM	
AK	-	15NM	
AKG	-	100I 15NM	
AKGYP	-	110I 15NM	
AKK	-	15NM	

I N D E X

SUBROUTINE DISP

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AKR	-	10DI	15NM	16NM	24=	49=	50=	52WR	55=	56=	58WR	60=	61=	63WR
		66=	67=	69WR										
AKRH	-	15NM												
AKRN	-	15NM												
AKRTAU	-	10DI	15NM											
AKSILOT	-	10DI	15NM	16NM	25=	26=	51=	52WR	57=	58WR	62=	63WR	68=	69WR
AKU	-	10DI	15NM											
ALA	-	10DI	15NM											
ALB	-	10DI	15NM											
ALE	-	10DI	15NM											
ALPPL	-	11DI	15NM											
ALS1	-	10DI	15NM											
ALS2	-	10DI	15NM											
AMIRR	-	6CO												
AMPRR	-	6CO												
AMWG	-	10DI	15NM											
ANITW	-	15NM												
ANN	-	15NM												
ANO	-	10DI	15NM											
AN2	-	15NM												
AOHM	-	15NM												
AONM	-	15NM												
A01	-	10DI	15NM											
A02	-	10DI	15NM											
A03	-	10DI	15NM											
A04	-	10DI	15NM											
A05	-	10DI	15NM											
APORT	-	11DI	15NM											
ATB	-	5CO												
BH	-	15NM												
* BLK005	-	4*												
* BLK008	-	5*												
* BLK009	-	6*												
* BLK021	-	7*												
* BLK027	-	8*												
BN	-	15NM												
BTAOL	-	15NM												
CKDUMP	-	10DI	15NM											
CM	-	15NM												
CRP	-	15NM												
CRT	-	15NM												
CRW	-	15NM												
C\$BAR	-	7CO												
CSCOEf	-	7CO	71=	75WR	78=	82WR								
CSTAR	-	15NM	16NM	27=	72=	75WR	79=	82WR	-					
CSTR	-	10DI	15NM	16NM	29=	74=	75WR	81=	82WR					
DE	-	15NM	16NM	31=	99=	100WR	103=	104WR						
DELF	-	15NM	16NM	22=	42=	43WR	46=	47WR						
DELT	-	6CO												
DELTSP	-	15NM												
DELTSS	-	15NM												
DELTST	-	15NM												
DELTTO	-	15NM												
DFL7	-	15NM												
DH1	-	15NM												

	DISP	IM	800	42	46	49	50	51	55	56	57	60	61	62	66
			67	68	71	72	74	78	79	81	92	96	99	103	106
*	DISP	-	1*												
	DLRF	-	15NM												
	DN1	-	15NM												
	DRVRF	-	15NM												
	DT	-	15NM		16NM	30=	92=	93WR	96=	97WR					
	DTAU	-	100I	15NM											
	DTAUW	-	100I	15NM											
	EPLA	-	100I	15NM											
	FPCN	-	100I	15NM											
	ERBAR	-	15NM	16NM	32=	106=	107WR	110=	111WR						
	FREXP	-	15NM												
	GAMA	-	15NM												
	CAMAG	-	100I	15NM											
	GFOCOM	-	90I	15NM											
	GEORUN	-	15NM												
	HCO	-	15NM												
	HHR	-	15NM												
	I	-	2300	24	2800	29	7300	74	75WR	8000	81	82WR			
	IHDATA	-	15NM	35RD											
	INISP	-	16NM	132WR											
	KDUMP	-	100I	15NM											
	KMOICG	-	15NM												
	KPLANE	-	15NM												
	LIST1	-	3LG	7CQ											
	MITOI	-	6CQ	20	38=	118=	119	120WR	124=	125	128=	129	130WR		
	MITSAV	-	8CQ	20=	38										
	MIZ	-	6CQ	119=	129=										
	MPNOM	-	5CQ	118	124										
	MPR	-	6CQ												
	MPTOI	-	6CQ												
	NACCEL	-	15NM												
	NAKFND	-	15NM												
	NAKR	-	15NM												
	NAKRST	-	15NM												
	NCASE	-	4CQ	19	20										
	NCASES	-	4CQ												
	NCM	-	15NM												
	NCSCOF	-	15NM												
	NCSTR	-	15NM												
	NDISP	-	4CQ	40											
	NDT	-	15NM												
	NEPS	-	15NM												
	NF	-	4CQ	21	131										
	NGED	-	130I	15NM											
	NGEOHD	-	15NM												
	NGEOMN	-	15NM												
	NIBOUT	-	18=	34	35RD										
	NLEWIS	-	4CQ												
	NMP	-	5CQ												
	NPA	-	15NM												
	NPH	-	15NM												
	NPUTAR	-	15NM												

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SUBROUTINE DISP

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TIMAX	-	15NM	
TIMFAC	-	100I	15NM
TIMECM	-	130I	15NM
TIMEDI	-	100I	15NM
TIMFPA	-	15NM	
TIMFPH	-	100I	15NM
TIMFPS	-	100I	15NM
TIMPT1	-	15NM	
TIMPT2	-	15NM	
TO	-	15NM	
TSLVR	-	100I	15NM
TSHLC	-	7C0	
TST	-	15NM	
TWER	-	7C0	
VCHINP	-	15NM	
VCHINP	-	15NM	
VFHQ	-	15NM	
VFNO	-	15NM	
WFACT	-	15NM	33=
WFTOL	-	15NM	
XCGHD	-	110I	15NM
XCGN	-	110I	15NM

```

1      SUBROUTINE FAMCAL (CFPROP,FINDP)
      C
      C      THE PURPOSE OF THIS SUBROUTINE IS TO DERIVE THE VEHICLE THRUST AND
      C      MASS FOR FLIGHT AND STATIC TEST FOR A RECONSTRUCTION.
2      IMPLICIT REAL (A-H,O-Z,M)
3      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP      ALL
4      COMMON/BLK015/ AT,ATBAR,MFIN,MFINRT,MFINIZ,MFOUTZ,MINST,MMOTI      RECON
5      COMMON/BLK016/ MFINIT,FI,MIF,MIFZ,MIR,FIZ,AITIN,AITVIN
6      COMMON/BLK017/ PHAR,PFLAG,PHEADZ,PHEPI,TIMEZ,TOL1,TOL3,MVEHI,      RECON
      $ NOZPOS      RECON
7      COMMON/BLK020/ A,MFOUT,PNS
8      COMMON/BLK021/ TSRFC,TFREC,CSBAR,PNSBAR,TMEB,PITW,CSCOFF(3),LIST1,RECON
      $ STATIC      RECON
9      COMMON/BLK023/ DATA(10),NWRDS,NUNIT
10     EQUIVALENCE (DATA(3),FLDCL),(DATA(4),AVEHI),(DATA(5),MM2EST),
      $ (DATA(6),MORH),(DATA(7),MET),(DATA(8),FSSME),
      $ (DATA(9),DRAG),(DATA(10),FM2EST)
11     COMMON/INPUTF/NPH,PHST(70),TIMEPH(70),NAKHST,TAUAKR(30),
      $ AKRTAU(30),NTAUTO,PCTAB
12     COMMON/PARMK/F,FP1,PEPO,CFOL,VFWEB,WD,DEEU,CLOPS,CF0,WGTOT,
      $ SWDOTN
13     LOGICAL LIST1,STATIC
14     CALL INERT
15     IF(NRECON.IE.1) RETURN
16     IF(NPH.GT.0) GO TO 50
17     MMOT = MMOTI - SWDOTN - MFINIT
18     IF(.NOT.STATIC) GO TO 40
19     IF(NOZPOS.NE.(-1)) GO TO 10
20     GO TO 30
21     IF(NOZPOS.EQ.0) GO TO 20
22     FIND = FLDCL + MMOT
23     GO TO 25
24     IF(NPH.GT.0) FIND = FLDCL - MMOT
25     CONTINUE
26     CALL CONT
27     FINDP= FIND-FI
28     CFPROP=FINDP/(PNS*AT)
29     RETURN
30     IF(NPH.GT.0) FIND = FLDCL
31     GO TO 25
32     MSRR = MINST + MMOT + MM2EST
33     MVEHI = MORH + MET + MSRR
34     FVFHI = MVEHI*AVEHI
35     FSRB = FVFHI - FSSME + DRAG
36     FIND = FSRB - FM2EST
37     CALL CONT
38     FINDP = FIND - FI
39     CFPROP = FINDP/(PNS*AT)
40     RETURN
41     IF(NPH.GT.0) FINDP=0.0
42     CFPROP=0.0
43     RETURN
44     END

```


SYMBOL	-----	REFERENCES	-----
10	-	19	21*
20	-	21	24*
25	-	23	25*
30	-	20	30*
40	-	18	32*
50	-	16	41*
A	-	7C0	
AITIN	-	5C0	
AITVIN	-	5C0	
AKRTAU	-	11C0	
AT	-	4C0	28
ATBAR	-	4C0	39
AVEHI	-	10E0	34
* BLK005	-	3*	
* BLK015	-	4*	
* BLK016	-	5*	
* BLK017	-	6*	
* BLK020	-	7*	
* BLK021	-	8*	
* BLK023	-	9*	
CF0	-	12C0	
CF0L	-	12C0	
CFPROP	-	1A6	28=
CLOPS	-	12C0	39=
* CON1	-	26*	42=
CSHAR	-	8C0	
CSC0EF	-	8C0	
DATA	-	9C0	10E0
DEED	-	12C0	
DRAG	-	10E0	35
EPI	-	12C0	
F	-	12C0	
* FAMCAL	-	1*	
FI	-	5C0	27
FIND	-	22=	24=
FINDP	-	1A6	27=
FIZ	-	5C0	28
FLUCL	-	10E0	22
FM2FSY	-	10E0	24
FRRH	-	35=	30
FSSME	-	10E0	36
FVEHI	-	7A=	35
* INERT	-	14*	
* INPUTF	-	11*	
LIST1	-	8C0	13L6
NET	-	10E0	33
MFIN	-	4C0	
MFINIT	-	5C0	17
MFINRT	-	4C0	
MFIN7	-	4C0	
MFOUT	-	7C0	
MFOUTZ	-	4C0	
MIF	-	5C0	

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SUBROUTINE FAMCAL (CFPROP,FINDP)

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MIFZ	-	5C0			
MINST	-	4C0	32		
MIR	-	5C0			
MMOT	-	17=	22	24	32
MMOTI	-	4C0	17		
MM2EST	-	10F0	32		
MMWR	-	10E0	33		
MSRR	-	32=	33		
MVEH1	-	6C0	33=	34	
NAKRST	-	11C0			
NCASES	-	3C0			
NDISP	-	3C0			
NF	-	3C0			
NLEWIS	-	3C0			
NOZPOS	-	6C0	19	21	
NPH	-	11C0	16		
NRECON	-	3C0	15		
NSI	-	3C0			
NTAU10	-	11C0			
NUNIT	-	9C0			
NWRMS	-	9C0			
* PAKMK	-	12*			
PBAR	-	6C0			
PCTAB	-	11C0			
PEP0	-	12C0			
PFLAG	-	6C0			
PHEADZ	-	6C0			
PHFPI	-	6C0			
PHST	-	11C0			
PITW	-	8C0			
PNS	-	7C0	28	39	
PNSRAR	-	8C0			
* RETURN	-	15*	29*	40*	43*
STATIC	-	8C0	13LG	18	
SWD0TN	-	12C0	17		
TAUAKR	-	11C0			
TEKEC	-	8C0			
TIMFPH	-	11C0			
TIMEZ	-	6C0			
TOL1	-	6C0			
TOL3	-	6C0			
TSREC	-	8C0			
TWER	-	8C0			
VFWFB	-	12C0			
WD	-	12C0			
WGTOT	-	12C0			

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```

1      SUBROUTINE FSCAL
2      C      THRUST TRACE SCALING MODULE (ROBERTS)
3      IMPLICIT REAL (A-H,O-Z,M)
4      COMMON/BLK004/ DTR,DTE,MC(30),AL,AK(15),CK(10),PCBT,ARETR,ARFTE, HATES
5      1 STBNL,SIBT,ETART,GBT,WGBT,OPR,DPE,AHALFE,CLAME,QAIE,WINF,WPE, RATES
6      2 OK(10),PAMBT,PEXBT,PEXIT
7      COMMON/BLK008/ ATB(50),AFSRM(50), MPNOM,TR,NMP,NTR FSCAL
8      COMMON/BLK009/ MIFOT,MPTOT,SII,AMIRR(10),AMPRR(10),DELT,MPRR,MIZ INERT
9      COMMON/BLK010/ NP(30) SISCAL
10     COMMON/BLK013/ CSTAR,SIAE,SIDE,WDE,ETANZ,CSTAR2,SIAON,ETANZ1, OUTPUT
11     3 CLAM1, SIRAT,SILDVH,SILOR,SIL2PB,SIAS,SILOVE,SILOE,SIL2PE OUTPUT
12     COMMON/BLK014/ PTPN,PFSRM,PMFSRM,PPC OUTPUT
13     DIMENSION TPN(50),FSRM(50),MFSRM(50),MPR(50),PC(50)
14     NPMAX = NP(0)
15     10 IF (NTB.GT.0) GO TO 20
16     TH = ATB(NPMAX-1)
17     20 TBNOM = ATB(NPMAX-1)
18     IF (NMP.GT.0) GO TO 30
19     MPTOT= MPNOM
20     30 TPN(1)=0.0
21     FSRM(1)=0.0
22     MFSRM(1)=0.0
23     MPR(1)=MPTOT
24     PC(1)=0.0
25     40 DO 50 I=2,NPMAX
26     TPN(I) = TR/TBNOM * ATB(I)
27     IF (TPN(I).GT.TH) RETURN
28     PTPN=TPN(I)
29     FSRM(I) = TBNOM/TH * MPTOT/MPNOM * AFSRM(I)
30     PFSRM=FSRM(I)
31     MFSRM(I)= FSRM(I)/SIDE
32     PMFSRM=MFSRM(I)
33     DELT=(TPN(I)-TPN(I-1))
34     MPR(I)=MPR(I-1) - (MFSRM(I-1)+ MFSRM(I))/2.0 * DELT
35     MPRR=MPR(I)
36     PC(I) = MC(1)*FSRM(I)
37     PPC=PC(I)
38     CALL INERT
39     CALL OUTPUT
40     50 CONTINUE
41     RETURN
42     END

```

SYMBOL	REFERENCES
10	11*
20	11 13*
30	14 16*
40	21*
50	2100 36*
AFSRM	4C0 25
AHALFE	3C0
AK	3C0
AL	3C0
AMIRR	5C0
AMPRR	5C0
ARFTB	3C0
ARLTL	3C0
ATB	4C0 12 13 22
* BLK004	3*
* BLK008	4*
* BLK009	5*
* BLK010	6*
* BLK013	7*
* BLK014	8*
CK	3C0
CLAME	3C0
CLAM1	7C0
CSTAR	7C0
CSTAR?	7C0
DELT	5C0 29= 30
DPB	3C0
DPE	3C0
DTR	3C0
DTE	3C0
ETART	3C0
ETANZ	7C0
ETANZ1	7C0
* FSCAL	1*
FSRM	9D1 17= 25= 26 27 32
I	2100 22 23 24 25 26 27 28 29 30 31 32 33
* INERT	34*
MC	3C0 32
MFSRM	9D1 18= 27= 28 30
MITOT	5C0
MIZ	5C0
MPNOM	4C0 15 25
MPR	9D1 19= 30= 31
MPRR	5C0 31=
MPTOT	5C0 15= 19 25
NMP	4C0 14
NP	6C0 10
NPMAX	10= 12 13 2100
NTB	4C0 11
OK	3C0
* OUTPUT	35*
PAMRT	3C0
PC	9D1 20= 32= 33

I N D E X

SUBROUTINE FISCAL

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PCBT	-	3C0							
PEXRT	-	3C0							
PEXIT	-	3C0							
PFSHM	-	8C0	26=						
PMFCHM	-	8C0	28=						
PPC	-	8C0	33=						
PTPN	-	8C0	24=						
QAIE	-	3C0							
QRT	-	3C0							
RETURN	-	23*	37*						
SIACON	-	7C0							
SIAP	-	7C0							
SIAS	-	7C0							
SIBAT	-	7C0							
SIBNL	-	3C0							
SIBY	-	3C0							
SIDF	-	7C0	27						
SII	-	5C0							
SILDVR	-	7C0							
SILOVE	-	7C0							
SILQH	-	7C0							
SILQE	-	7C0							
SIL2PB	-	7C0							
SIL2PF	-	7C0							
IB	-	4C0	12=	22	23	25			
TRNOM	-	13=	22	25					
IPN	-	9DI	16=	22=	23	24	29		
WDE	-	7C0							
WINE	-	3C0							
WPBT	-	3C0							
WPE	-	3C0							

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```

1      SUBROUTINE GETDAT(TIME)
2      COMMON/BLK023/ DATA(10),NWRDS,NUNIT
3      DIMENSION SAVE(10)
4      IF(TIME.EQ.0.0) GO TO 10
5      IF(TIME.LT.0.0) GO TO 90
6      GO TO 50
7      10 REWIND NUNIT
8      12 READ(NUNIT,END=70) (DATA(I),I=1,NWRDS)
9      IF(DATA(1).EQ.0.0) GO TO 20
10     IF(DATA(1).GT.0.0) GO TO 30
11     DO 15 J=1,NWRDS
12     15 SAVE(J)=DATA(J)
13     GO TO 12
14     20 DO 25 I=1,NWRDS
15     25 SAVE(I)=DATA(I)
16     RETURN
17     30 DO 40 I=1,NWRDS
18     40 DATA(I)= SAVE(I)+(DATA(I)-SAVE(I))*(TIME-SAVE(1))/(DATA(1)-SAVE(1)
19     $)
19     RETURN
20     50 READ(NUNIT,END=70) (DATA(I),I=1,NWRDS)
21     IF(DATA(1).GE.TIME) GO TO 30
22     DO 60 J=1,NWRDS
23     60 SAVE(J)=DATA(J)
24     GO TO 50
25     70 WRITE(6,80) TIME,DATA(1)
26     80 FORMAT('ERROR IN GETDAT OF RECON MODULE/'0NO TIME MATCH FOUND',
27     $ 10X,'TIME=',E15.8,5X,'DATA(1)=',E15.8)
27     STOP
28     90 WRITE(6,100) TIME
29     100 FORMAT('ERROR IN GETDAT OF RECON MODULE/'0TIME LESS THAN ZERO')
30     STOP
31     END

```

SYMBOL	-----	REFERENCES	-----
10	-	4	7*
12	-	8*	13
15	-	1100	12*
20	-	9	14*
25	-	1400	15*
30	-	10	17*
40	-	1700	18*
50	-	6	20*
60	-	2200	23*
70	-	8RD	20RD
80	-	25WR	26*
90	-	5	28*
100	-	28WR	29*
* BLK023	-	2*	
DATA	-	2CO	ARD
* GETDAT	-	1*	
1	-	ARD	1400
J	-	1100	12
NUNIT	-	2CO	7
NWRDS	-	2CO	ARD
* RETURN	-	16*	19*
SAVE	-	301	12*
* STOP	-	27*	30*
TIME	-	1AG	4

9	10	12	15	18*	20RD	21	23	25WR
15	1700	18	20RD					
2200	23	ARD	20RD					
1100	1400	1700	20RD	2200				
15*	18*	20*	23*	25*				

```

1      SUBROUTINE INERT
      C
      C INERT MASS MODULE (HARRIS)
      C
      C INITIALIZE MIZ=MITOT AT THE BEGINNING OF EACH CASE
      C
2      IMPLICIT REAL (A-H,O-Z,M)
3      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASE5,NDISP,NCASE      ALL
4      COMMON/BLK009/ MITOT,MPTOT,SII,AMIRR(10),AMPRR(10),DELT,MPR,MIZ, INERT
5      COMMON/BLK010/ NP(30)
6      COMMON/BLK016/ MFINIT,FI,MIF,MIFZ,MIR,FIZ,AITIN,AITVIN
7      COMMON/COMA/DELT,APHI,WOOTI,ANIBO,TIMEW,UT,ANLOPS,ACCFL,
      1 ABCYL,PRNT(101,15),AINCHI,AMACH,2CALC(101)
8      COMMON/PARWF/PH,TIME,AINCW,T,P,DELTA,U,AKBY,PON,DIS,AMPN,AT,
      1 AMW,AKRST
9      COMMON/PARMV/WF
10     IF(NF.EQ.0) GO TO 10
11     MPR=WF
12     IF(TIME.NE.0.0) GO TO 5
13     DELTIM=DELT
14     MPTOT=WF
15     GO TO 20
16     5 DELTIM = TIME-TIMEZ
17     GO TO 20
18     10 DELTIM=DELT
19     20 MPRR=MPR/MPTOT
20     CALL LIN(AMPRR,AMIRR,NP(10),MPRR,MIRR,10)
21     MIR = MITOT*MPRR
22     MIF =(MIZ-MIR)/DELTIM
23     MFINIT = MFINIT + ((MIF+MIFZ)/2.0)*DELTIM
24     MIZ = MIR
25     MIFZ=MIF
26     FI = MIF*SII
27     AITIN = AITIN+0.5*(FI+FIZ)*DELTIM
28     AITVIN = AITIN
29     FIZ = FI
30     IF(NF.NE.0) TIMEZ=TIME
31     RETURN
32     END

```


SYMBOL	-----	REFERENCES	-----
S	-	12	16*
10	-	10	18*
20	-	15	17
ABCYL	-	7C0	19*
ACCFI	-	7C0	
AINCHI	-	7C0	
AJNCW	-	8C0	
AITIN	-	6C0	27=
AIIVIN	-	6C0	28=
AKGY	-	8C0	
AKKST	-	8C0	
A4ACH	-	7C0	
AMIRR	-	4C0	20AG
AMPH	-	8C0	
AMPER	-	4C0	20AG
AMW	-	8C0	
ANIRU	-	7C0	
ANLOPS	-	7C0	
APHI	-	7C0	
AT	-	8C0	
* BLK005	-	3*	
* BLK009	-	4*	
* BLK010	-	5*	
* BLK016	-	6*	
* COMA	-	7*	
UFLT	-	4C0	18
UELTA	-	8C0	
UELTIM	-	13=	16=
UELTT	-	7C0	13
DIS	-	8C0	
FI	-	6C0	26=
FIZ	-	6C0	27
* INFRT	-	1*	27=
* LIN	-	20*	
MF INIT	-	6C0	23=
MIF	-	6C0	22=
MIF7	-	6C0	23
MIR	-	6C0	21=
MIRP	-	20AG	21
MITOT	-	4C0	21
MIZ	-	4C0	22
MPR	-	4C0	11=
MPRR	-	19=	20AG
MPLOT	-	4C0	14=
NCASE	-	3C0	
NCASES	-	3C0	
NDISP	-	3C0	
NF	-	3C0	10
NLEWIS	-	3C0	30
NP	-	5C0	20AG
NRECON	-	3C0	
NSI	-	3C0	
P	-	8C0	

INDEX

SUBROUTINE INERT

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```

* PARMF ~ 8*
* PARMV ~ 9*
PH ~ 8C0
PON ~ 8C0
PRNT ~ 7C0
* RETURN ~ 31*
SII ~ 4C0 26
I ~ 8C0
TIME ~ 8C0 12 16 30
TIMEW ~ 7C0
THE VARIABLE= TIMEZ -IS USED BEFORE IT IS DEFINED
TIMEZ ~ 16 30=
U ~ 8C0
UT ~ 7C0
WDOTI ~ 7C0
WF ~ 9C0 11 14
ZCALC ~ 7C0

```

```
1  SUBROUTINE INIT1
2  IMPLICIT REAL (A-H,O-Z,M)
3  LOGICAL ERR,LIST1,STATIC
4  COMMON/BLK001/IRKT01,IRKT02,ERR,IN
5  COMMON/BLK009/ MITOT,MPTOT,SII,AMIRR(10),AMPRR(10),DELT,MPR,M17  INERT
6  COMMON/BLK016/ MFINIT,F1,MIF,MIFZ,MIR,F1Z,AITIN,AITVIN
7  ERR = .FALSE.
8  MFINIT = 0.0
9  MIFZ=0.0
10 M17=MITOT
11 F1Z = 0.0
12 AITIN=0.0
13 RETURN
14 END
```

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SYMBOL		REFERENCES	
	AITIN - 6C0	12=	
	AITVIN - 6C0		
	AMIRR - 5C0		
	AMPRR - 5C0		
*	BLK001 - 4*		
*	BLK009 - 5*		
*	BLK016 - 6*		
	DELT - 5C0		
	ERR - 3LG	4C0	7=
	FI - 6C0		
	FIZ - 6C0	11=	
	IN - 4C0		
*	INIT1 - 1*		
	IRKT01 - 4C0		
	IRKT02 - 4C0		
	LIST1 - 3LG		
	MFINIT - 6C0	8=	
	MIF - 6C0		
	MIFZ - 6C0	9=	
	MIR - 6C0		
	MITOT - 5C0	10	
	MIZ - 5C0	10=	
	MPR - 5C0		
	MPTOT - 5C0		
*	RETURN - 13*		
	SII - 5C0		
	STATIC - 3LG		

CCC

2-50

```

39      WRITE(NOUT,20) (A(I),I=1,10)
40      WRITE(6,35) (A(I),I=1,10)
41      35 FORMAT(' ',10A8)
      C
      C
      C      WRITE IBM DATA FROM FIRST CASE ON UNIT NIBOUT FOR LATER RECALL
42      IF(NWRIBM.EQ.1) WRITE(NIBOUT,20) (A(I),I=1,10)
43      IF(A(1).EQ.IBM .AND. NCASE.EQ.0) NWRIBM=1
44      IF(A(1).EQ.CASE) GO TO 30
45      GO TO 10
46      30 END FILE NOUT
47      WRITE(6,40)
48      40 FORMAT('0ALL DATA CARDS FOR THIS CASE HAVE BEEN TRANSFERRED TO DISK
      $')
49      REWIND NOUT
50      IF(NCASE.EQ.0) END FILE NIBOUT
51      IF(NWRIBM.EQ.1) NIBFLG=1
      C
      C
      C      SEARCH FOR CONTROL DATA
52      50 READ(NOUT,20,END=110) (A(I),I=1,10)
53      IF(A(1).EQ.CONT) GO TO 60
54      GO TO 50
55      60 READ(NOUT,INPUT1)
      C
      C
      C      SEARCH FOR TYPE OF DATA AVAILABLE
56      70 READ(NOUT,20,END=80) (A(I),I=1,10)
57      IF(A(1).EQ.LEWIS) NL=1
58      IF(A(1).EQ.IDN) NIDN=1
59      IF(A(1).EQ.IBM) NIBM=1
60      GO TO 70
      C
      C
      C      TEST FOR SUFFICIENT DATA AVAILABLE TO RUN CASE
61      80 IF(NLEWIS.EQ.1 .AND. NL.EQ.0) GO TO 130
62      IF(NSI.EQ.3 .AND. NIDN.EQ.0) GO TO 130
63      IF(NF .GT.0 .AND. NIBM.EQ.0) GO TO 130
      C
      C
      C      WRITE HEADER AND TITLE
64      WRITE(6,90) (HEADER(I),I=1,20)
65      90 FORMAT('1',17(/),T25,84('1')/T25,'1',82X,'1'/T25,'1',20A4,'1'*/
      $T25,'1',82X,'1')
66      WRITE(6,100) (TITLE(I),I=1,20)
67      100 FORMAT(T25,'1',20A4,'1'*/T25,'1',82X,'1'*/T25,84('1'))
68      REWIND NOUT
69      RETURN
      C
      C
      C      ERROR STATEMENTS
70      110 WRITE(6,120)
71      120 FORMAT('0***ERROR***NO CONTROL DATA SECTION')
72      125 REWIND NOUT
73      GO TO 5

```

I N D E X

SUBROUTINE INPUT

PAGE 11

```
74      130 WRITE(6,140)
75      140 FORMAT(10***ERROR***[INSUFFICIENT DATA TO RUN THIS CASE])
76      GO TO 125
77      150 WRITE(6,160)
78      160 FORMAT(' ',28(/),T45,'A L L D A T A C A S E S C O M P L E T E D
79              $ ')
80              STOP
              END
```

I N D E X

SUBROUTINE INPUT

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SYMBOL	-----	REFERENCES	-----
5	-	29*	73
8	-	30WR	31*
10	-	37*	45
20	-	37RD	38*
30	-	44	46*
35	-	40WR	41*
40	-	47WR	48*
50	-	52*	54
60	-	53	55*
70	-	56*	60
80	-	56RD	61*
90	-	64WR	65*
100	-	66WR	67*
110	-	52RD	70*
120	-	70WR	71*
125	-	72*	76
130	-	61	62
140	-	74WR	75*
150	-	37RD	77*
160	-	77WR	78*
A	-	23RL	37RD
AFSRM	-	7CO	26NM
AHALFE	-	4CO	26NM
AHALF1	-	6CO	26NM
AK	-	4CO	26NM
AL	-	4CO	26NM
ALPHA	-	18CO	26NM
AMIRR	-	8CO	26NM
AMPRR	-	8CO	26NM
ARET	-	6CO	26NM
ARETB	-	4CO	26NM
ARETE	-	4CO	26NM
AT	-	11CO	
ATB	-	7CO	26NM
ATBAR	-	11CO	26NM
* BLK001	-	3*	
* BLK004	-	4*	
* BLK005	-	5*	
* BLK007	-	6*	
* BLK008	-	7*	
* BLK009	-	8*	
* BLK010	-	9*	
* BLK011	-	10*	
* BLK015	-	11*	
* BLK017	-	12*	
* BLK018	-	13*	
* BLK021	-	14*	
* BLK025	-	15*	
* BLK026	-	16*	
* BLK027	-	17*	
* BLK028	-	18*	
CASF	-	23RL	24DA
CK	-	4CO	26NM

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025G-10020-4

SUBROUTINE INPUT

[illegible]

I N D E X

SUBROUTINE INPUT

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NRECON	-	5C0	26NM		
NSI	-	5C0	26NM	62	
NTAPE	-	15C0	26NM		
NTB	-	7C0	26NM		
NWRIBH	-	36=	42	43=	51
OK	-	4C0	26NM		
PADJC	-	13C0	26NM		
PAMBT	-	4C0	26NM		
PAMT	-	6C0	26NM		
PRAR	-	12C0	26NM		
PCAVE	-	6C0	26NM		
PCBT	-	4C0	26NM		
PCT	-	6C0	26NM		
PEXRT	-	4C0			
PEXIT	-	4C0			
PFLAG	-	12C0	26NM		
PHCAU2	-	12C0			
PHEPI	-	12C0	26NM		
PITW	-	14C0	26NM		
PNSRAR	-	14C0			
QAIF	-	4C0	26NM		
QBT	-	4C0	26NM		
QEX	-	18C0	26NM		
* RETURN	-	69=			
SETFLG	-	17C0			
SIHNL	-	4C0	26NM		
SIBT	-	4C0	26NM		
SICON	-	6C0	26NM		
SII	-	8C0	26NM		
SILSB	-	18C0	26NM		
STATIC	-	14C0	19LG	26NM	
* STOP	-	79=			
IB	-	7C0	26NM		
TERFC	-	14C0	26NM		
TIMEZ	-	12C0			
TITLE	-	20D1	22DA	26NM	66WR
TOL1	-	12C0			
TOL3	-	12C0			
TSOL	-	10C0			
TSRFC	-	14C0	26NM		
TWEH	-	14C0	26NM		
WD2	-	6C0	26NM		
WINF	-	4C0	26NM		
WPBT	-	4C0	26NM		
WPE	-	4C0	26NM		
XLAMHD	-	18C0	26NM		

I N D E X

SUBROUTINE INTREC

PAGE 46

```

1      SUBROUTINE INTREC
      C
      C      THIS ROUTINE INITIALIZES DATA FOR A RECONSTRUCTION RUN.
      C
2      LOGICAL ICOMP
3      COMMON/BLK022/ ICOMP,IPASS
4      COMMON/BLK024/ AFIT,ADFL,ICOUNT
5      COMMON/INPUTF/NPH,PHST(70),TIMEPH(70),NAKRST,TAUAKR(30),
      C      AKRTAU(30),NTAUTO,PCTAB
6      COMMON/INPUTM/STFLAG,STDYST,DELTST,DELTSS,DELTTO
7      COMMON/INPUTN/AITST,PST,TST,TIMPT1,TIMPT2,DELTSP,ANITW
8      STDYST=0.0
9      STFLAG=1.0
10     TST=1000.
11     NAKRST=0
12     ICOMP=.FALSE.
13     IPASS=0
14     AFIT=0.0
15     ICOUNT=0
16     RETURN
17     END

```

RECON

SYMBOL	REFERENCES
ADEL - 400	
AFIT - 400	14=
AITST - 700	
AKRTAU - 500	
ANITW - 700	
* BLK022 - 3*	
* BLK024 - 4*	
DELTSP - 700	
DELTSS - 600	
DELTST - 600	
DELTTO - 600	
ICOMP - 2LG	300 12=
ICOUNT - 400	15=
* INPUTF - 5*	
* INPUTM - 6*	
* INPUTN - 7*	
* INTREC - 1*	
IPASS - 300	13=
NAKRST - 500	11=
NPH - 500	
NTAUT0 - 500	
PCTAB - 500	
PHST - 500	
PST - 700	
* RETURN - 16*	
STOYST - 600	8=
STFLAG - 600	9=
TAUAKR - 500	
TIMEPH - 500	
TIMPT1 - 700	
TIMPT2 - 700	
TST - 700	10=

```

1 SUBROUTINE ITIONZ
2 IMPLICIT REAL*8 (A-H,O-Z)
3 LOGICAL ERR
4 REAL*8 IUNOZ//IDNOZI D//
5 COMMON/HLK001/IRKTO1,IPKTO2,ERR,IN
6 COMMON/COM01/ISTAGK,TEXTITK,CHFN,FXEN,PROP,WTMOLG,CUGO,
7 1 PARWT,ACH,S1,DPL,S1DP2,RARC1,RARC2,ARF,NQZ1YP,INDRUG,INDNPT
8 COMMON/COM02/FTAG,FTAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
9 1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPC0,CPC,CP,CP,CP,CP,
10 2 DFL1,CFEN0,DMON0,DMON1,DNLST,DOMAX,DUMAX,DX,DX0,EP51,EP52,EP5M,
11 3 EPSM2,EP5N,FP5U,FRORR,FULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMAC,
12 4 GMSSP,GNUMG,GMUS,GNLST,GNUM,H0,H0N,H0U,H0NX,HLM,HM,HSM,HSTAG,
13 5 HUPX,P,PRG,PSTAG,QUDF,QUEH,R,RC,REP,RGAS,RHO,RH00NL,PHOST,RP,
14 6 RTH,SLCYA,SIGX,SORM,TAN,TAUG,TG,TGO,TH,TP,TSTAG,TT,UB,UG,UGO,
15 7 UG00,UG00N,UG0UP,UG0NX,UGUPX,UP,UP0,UP00N,UP0UP,UPDX,UPBUX,UT,
16 8 WPMG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
17 COMMON/C003/ATAHL(3),UY(3),HDN(500),HTHL(500),HUP(100),RTAHL(3),
18 1 UG0N(500),UGTHL(500),UGUP(500),UP0N(500),UPTHL(500),UPUP(500),
19 2 WORK(33),XDN(500),XTHL(500),XUP(500)
20 COMMON/COM04/CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUE2,CUE4,CURR,OY1LST,
21 1 EL0,EL1,EL2,EL4,GAMRAP,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,FLPMH,
22 2 UTPR,RPLST
23 NAMELIST/ONEIDNZ/
24 3 PSTAG,ISTAGK,TEXTITK,CHFN,FXEN,GMUS,PROP,ALPHA,CPL,CP,CP,CP,HLM,HSM,
25 4 TH,PARWT,GMSSP,ATAHL,EP51,EP5M,DX0,RTAHL,WTMOLG,INDNPT,INDRUG
26 CALL DATLOC(IUNOZ)
27 IF(ERR) RETURN
28 READ(IN,ONEIDNZ)
29 RETURN
30 END

```

ORIGINAL PAGE IS
OF POOR QUALITY

SYMBOL	-----	REFERENCES	-----
ALPHA	- 7C0 10NM		
ARF	- 6C0		
ATABL	- 8C0 10NM		
* BLK001	- 5*		
BLOW	- 7C0		
CAYR	- 9C0		
CAY1	- 9C0		
CAY2	- 9C0		
CAY4	- 9C0		
CHEN	- 6C0 10NM		
CNST1	- 7C0		
CNST10	- 7C0		
CNST2	- 7C0		
CNST3	- 7C0		
CNST4	- 7C0		
CNST5	- 7C0		
CNST6	- 7C0		
CNST7	- 7C0		
CNST8	- 7C0		
CNST9	- 7C0		
* COM01	- 6*		
* COM02	- 7*		
* COM03	- 8*		
* COM04	- 9*		
CPLG	- 7C0		
CPG	- 7C0		
CPL	- 7C0 10NM		
CPP	- 7C0		
CPS	- 7C0 10NM		
CUER	- 9C0		
CUE0	- 9C0		
CUE1	- 9C0		
CUE2	- 9C0		
CUE4	- 9C0		
CUG0	- 6C0		
* DATLOC	- 11*		
DELU	- 7C0		
DENOM	- 7C0		
DMOND	- 7C0		
DMONU	- 7C0		
DNLST	- 7C0		
DQMAX	- 7C0		
UUMAX	- 7C0		
DX	- 7C0		
DX0	- 7C0 10NM		
OY	- 8C0		
OY1LST	- 9C0		
EL0	- 9C0		
EL1	- 9C0		
EL2	- 9C0		
EL2MH	- 9C0		
EL4	- 9C0		
EPSM	- 7C0 10NM		

EPSM2	-	7C0		
EPSN	-	7C0		
EPSU	-	7C0		
EPS1	-	7C0	10NM	
EPS2	-	7C0		
ERR	-	3LG	5C0	12
ERROR	-	7C0		
ETAG	-	7C0		
ETAP	-	7C0		
EULST	-	7C0		
EXEN	-	6C0	10NM	
FCTR	-	7C0		
FX1	-	7C0		
FX2	-	7C0		
FX3	-	7C0		
G	-	7C0		
GAMHAP	-	9C0		
GAMMA	-	7C0		
GMACH	-	7C0		
GMSSP	-	7C0	10NM	
GMUG	-	7C0		
GMUS	-	7C0	10NM	
GNLST	-	7C0		
GNUM	-	7C0		
H	-	7C0		
HON	-	8C0		
HONX	-	7C0		
HLM	-	7C0	10NM	
HM	-	7C0		
HSM	-	7C0	10NM	
HSTAG	-	7C0		
HTbl	-	8C0		
HUP	-	8C0		
HUPX	-	7C0		
HQ	-	7C0		
HQD	-	7C0		
HQU	-	7C0		
IDHUG	-	6C0	10NM	
IDNGZ	-	4RL	11AG	
IDNPRT	-	6C0	10NM	
IN	-	5C0	13RD	
IRKT01	-	5C0		
IRKT02	-	5C0		
I I I D N Z	-	1*		
NOZTYP	-	6C0		
ONEDN7	-	10NM	13RD	
P	-	7C0		
PARWT	-	6C0	10NM	
PRG	-	7C0		
PROP	-	6C0	10NM	
PSTAG	-	7C0	10NM	
QUAN1	-	9C0		
QUAN2	-	9C0		
QUAN3	-	9C0		
QUAN4	-	9C0		

I N D E X

SUBROUTINE IDENTIFICATION

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QUANS	-	9C0	
QUED	-	7C0	
QUEH	-	7C0	
R	-	7C0	
RARC1	-	6C0	
RARC2	-	6C0	
RC	-	7C0	
RCH	-	6C0	
REP	-	7C0	
RETURN	-	12*	14*
RGAS	-	7C0	
RHO	-	7C0	
RHOST	-	7C0	
RHOONL	-	7C0	
RP	-	7C0	
RPLST	-	9C0	
RTAHL	-	8C0	10NM
RTH	-	7C0	
SIGMA	-	7C0	
SIGX	-	7C0	
SLOP1	-	6C0	
SLOP2	-	6C0	
SOKM	-	7C0	
TAU	-	7C0	
TAUG	-	7C0	
TFXITK	-	6C0	10NM
IG	-	7C0	
IGD	-	7C0	
IM	-	7C0	10NM
IP	-	7C0	
ISTAG	-	7C0	
ISTAGK	-	6C0	10NM
IT	-	7C0	
UG	-	7C0	
UGDN	-	8C0	
UGDNX	-	7C0	
UGTBL	-	8C0	
UGUP	-	8C0	
UGUPX	-	7C0	
UGO	-	7C0	
UGOIN	-	7C0	
UGOUP	-	7C0	
UGON	-	7C0	
UP	-	7C0	
UPUN	-	8C0	
UPONX	-	7C0	
UPTBL	-	8C0	
UPUP	-	8C0	
UPUPX	-	7C0	
UPO	-	7C0	
UPODN	-	7C0	
UPOUP	-	7C0	
UT	-	7C0	
UTPR	-	9C0	
UO	-	7C0	

INDEX

SUBROUTINE IIONZ

PAGE 61

WORK	-	800	
WPWG	-	700	
WTMLG	-	600	IONM
X	-	700	
XDN	-	800	
XF	-	700	
XMAX	-	700	
XT	-	700	
XTBL	-	800	
XUP	-	800	
XX	-	700	
X0	-	700	
X00	-	700	
X1	-	700	
X2	-	700	
X3	-	700	

.....

```

1  SUBROUTINE LESSQ(P,CS,N,X)
2  DIMENSION P(N),CS(N),X(3)
3  SUMX =0.0
4  SUMX2 =0.0
5  SUMX3 =0.0
6  SUMX4 =0.0
7  SUMY =0.0
8  SUMXY =0.0
9  SUMX2Y=0.0
10 DO 5 I=1,N
11  SUMX = SUMX +P(I)
12  SUMX2= SUMX2 +P(I)**2
13  SUMX3= SUMX3 +P(I)**3
14  SUMX4= SUMX4 +P(I)**4
15  SUMY = SUMY +CS(I)
16  SUMXY= SUMXY +P(I)*CS(I)
17 5 SUMX2Y=SUMX2Y+P(I)**2*CS(I)
18  FN=N
19  TOP=(SUMX*SUMY - FN*SUMXY)*(SUMX*SUMX2 - FN*SUMX3)
20  TOP2= (SUMX2*SUMY - FN*SUMX2Y)*((SUMX)**2 - FN*SUMX2)
21  BOT = (SUMX*SUMX2 - FN*SUMX3)*(SUMX*SUMX2 - FN*SUMX3)
22  BOT2=((SUMX2)**2 - FN*SUMX4)*((SUMX)**2 - FN*SUMX2)
23  X(3)=(TOP-TOP2)/(BOT-BOT2)
24  X(2)=((SUMX*SUMY-FN*SUMXY) -X(3)*(SUMX*SUMX2-FN*SUMX3))/
25  $ (SUMX**2 - FN*SUMX2)
26  X(1)=(SUMY -SUMX*X(2) - SUMX2*X(3))/FN
27  RETURN
28  END

```

SYMBOL	-----	REFERENCES	-----
B	-	1000	17*
BOT	-	21=	23
BOT2	-	22=	23
CS	-	1AG	201 15 16 17
FN	-	18=	19 20 21 22 24 25
I	-	1000	11 12 13 14 15 16 17
* LESSQ	-	1*	
N	-	1AG	201 1000 18
P	-	1AG	201 11 12 13 14 16 17
* RFTURN	-	26*	
SUMX	-	3=	11= 19 20 21 22 24 25
SUMXY	-	8=	16= 19 24
SUMX2	-	4=	12= 19 20 21 22 24 25
SUMX2Y	-	9=	17= 20
SUMX3	-	5=	13= 19 21 24
SUMX4	-	6=	14= 22
SUMY	-	7=	15= 19 20 24 25
TOP	-	19=	23
TOP2	-	20=	23
X	-	1AG	201 23= 24= 25=

1	SUBROUTINE LEWIT	
2	LOGICAL ERR	
3	COMMON/BLK001/IRKT01,IRKT02,ERR,IN	
4	DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS	80
5	COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13)	190
	1 ,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13)	200
	2 ,VLM(13),TOTN(13)	210
6	COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VACI(13),SUBAR(13),SUPAR(13)	340
	1 ,APP(13),AEAT(13),CSTR,EOL,FROZ,SS0,AREA,AWT	350
7	IRKT02=1	
8	DO 300 I=1,26	
9	PCP(I)= 0.	
10	SUBAR(I) = 0.	
11	P(I)= 0.	
12	300 CONTINUE	
13	RETURN	
14	END	

SYMBOL	-----	REFERENCES	-----
300	-	800	12*
AEAT	-	600	
APP	-	600	
AREA	-	600	
AWT	-	600	
* BLK001	-	3*	
CPH	-	408	500
CSTR	-	600	
DLVPT	-	408	500
DLVTP	-	408	500
EOL	-	600	
ERR	-	2LG	300
FROZ	-	600	
GAMMAS	-	408	500
HSUM	-	408	500
I	-	800	9 10 11
IN	-	300	
IRKT01	-	300	
IRKT02	-	300	7*
* LEWIT	-	1*	
P	-	500	11*
PCP	-	600	9*
* PERF	-	6*	
* POINTS	-	5*	
PPP	-	500	
* RETURN	-	13*	
SONVEL	-	500	
SPIM	-	600	
SSUM	-	408	500
SSU	-	600	
SUHR	-	600	10*
SUPAR	-	600	
T	-	500	
TOTN	-	500	
TYT	-	500	
V	-	500	
VACT	-	600	
VLM	-	500	
VMOC	-	600	
WM	-	500	

D256-10020-4

```

1      SUBROUTINE LIN (XTABLE,YTABLE,N,X,Y,JJ)
C      **LINEAR INTERPOLATION. XTABLE MUST BE IN ASCENDING MAGNITUDE.
C      DEPENDENT ENTRY CAN BE IN RANDOM MAGNITUDE FROM SEQUENTIAL CALLS
2      DIMENSION XTABLE(N),YTABLE(N)
3      IF(X.GT.XTABLE(N)) GO TO 30
4      IF(X.LT.XTABLE(1)) GO TO 40
5      DO 10 I= 1,N
6      IF(X.LE.XTABLE(I)) GO TO 20
7      10 CONTINUE
8      20 IF(X.EQ.XTABLE(I)) GO TO 50
9      J=I-1
10     SLOPE = (YTABLE(I)-YTABLE(J))/(XTABLE(I)-XTABLE(J))
11     DELTAX = X- XTABLE(J)
12     DELTAY = SLOPE * DELTAX
13     Y= YTABLE(J)+DELTAY
14     RETURN
15     30 WRITE(6,60) X
16     GO TO 45
17     40 WRITE(6,70) X
18     45 WRITE(6,80) JJ
19     STOP
20     50 Y=YTABLE(I)
21     RETURN
22     60 FORMAT('1',5X,'THE INDEPENDENT ENTRY IS ABOVE THE TABLE ',D15.7)
23     70 FORMAT('1',5X,'THE INDEPENDENT ENTRY IS BELOW THE TABLE ',D15.7)
24     80 FORMAT('D  TABLE NO. =',I4)
25     END

```

I N D E X

SUBROUTINE LIN (XTABLE,YTABLE,N,X,Y,JJ)

PAGE 67

SYMBOL	-----	REFERENCES	-----
10	-	500	7*
20	-	6	8*
30	-	3	15*
40	-	4	17*
45	-	16	18*
50	-	8	20*
60	-	15WR	22*
70	-	17WR	23*
80	-	18WR	24*
DELTA X	-	11=	12
DELTA Y	-	12=	13
I	-	500	6 8 9 10 20
J	-	9=	10 11 13
JJ	-	1AG	18WR
* LIN	-	1*	
N	-	1AG	20I 3 500
* RETURN	-	14*	21*
SLOPE	-	10=	12
* STOP	-	19*	
X	-	1AG	3 4 6 8 11 15WR 17WR
XTABLE	-	1AG	20I 3 4 6 8 10 11
Y	-	1AG	17* 20=
YTABLE	-	1AG	20I 10 13 20

```
1      SUBROUTINE OUTPUT
2      IMPLICIT REAL (A-H,O-Z,M)
3      COMMON/BLK012/ NPRINT
4      COMMON/BLK019/ NL600
5      GO TO (100,200,300,400,500,600,700,800),NPRINT
6      100 CALL PRT1
7          NL600=50
8          GO TO 1000
9      200 CALL PRT2
10         GO TO 1000
11      300 CALL PRT3
12         GO TO 1000
13      400 CALL PRT4
14         GO TO 1000
15      500 CALL PRT5
16         GO TO 1000
17      600 CONTINUE
18         CALL PRT6
19         GO TO 1000
20      700 CONTINUE
21         CALL PRT7
22         GO TO 1000
23      800 CONTINUE
24         CALL PRT8
25      1000 CONTINUE
26      RETURN
27      END
```


SYMBOL		REFERENCES												
100	-	5	6*											
200	-	5	9*											
300	-	5	11*											
400	-	5	13*											
500	-	5	15*											
600	-	5	17*											
700	-	5	20*											
800	-	5	23*											
1000	-	6	10	12	14	16	19	22	25*					
* BLK012	-	3*												
* BLK019	-	4*												
* NL600	-	400	7*											
* NPRINT	-	300	5											
* OUTPUT	-	1*												
* PRT1	-	6*												
* PRT2	-	9*												
* PRT3	-	11*												
* PRT4	-	13*												
* PRT5	-	15*												
* PRT6	-	18*												
* PRT7	-	21*												
* PRT8	-	24*												
* RETURN	-	26*												

I N D E X

FUNCTION PADJ(TIME)

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```
1      FUNCTION PADJ(TIME)
2      COMMON/BLK018/ PADJC(2)                PADJ
3      C      ADJUSTMENT TERMS FOR PHEAD TO PNS
4      PADJ = PADJC(1)*TIME + PADJC(2)
5      RETURN
6      END
```

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FUNCTION PADD(TIME)

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SYMBOL	REFERENCES
* BLK018 - 2*	
* PADD - 1*	3=
* PADDJC - 2C0	3
* RETURN - 4*	
* TIME - 1AG	3

```

1  SUBROUTINE PRESET
2  IMPLICIT REAL (A-H,O-Z,M)
3  LOGICAL LIST1,STATIC,ERR
4  COMMON/BLK001/IRKT01,IRKT02,ERR,IN
5  COMMON/BLK004/ DTB,OTE,MC(30),AL,AKT(15),CK(10),PCBT,ARFTB,ARETE,  BATES
6  1 SIGNL,SIBT,ETABT,GBT,WGBT,OPB,DPE,ANALFE,CLAME,QAIE,WINE,WPE,  BATES
7  2 OK(10),PAMBT,PEXBT,PEXIT
8  COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE  ALL
9  COMMON/BLK008/ ATB(50),AFSRN(50), MPNOM,TB,NMP,NTR  FSCAL
10 COMMON/BLK021/ TSREC,TEREC,CSBAR,PNSBAR,TWEB,PITW,CSCOE(3),LIST1,RECON
11 $ STATIC  RECON
12 COMMON/BLK025/ NYAPE,NPLOT,NCARD
13 CLAME=0.0
14 DPB=0.0
15 DPE=0.0
16 IRKT01=0
17 LIST1=.TRUE.
18 NCARD=0
19 NCASES=1
20 NDISP=0
21 NF=1
22 NLEWIS=0
23 NMP=0
24 NPLOT=0
25 NRECON=0
26 NSI=1
27 NTAPE=0
28 NTB=0
29 SIGNL=0.0
30 SIBT=0.0
31 RETURN
32 END

```


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SUBROUTINE PRESET

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SIHY	-	5C0	27=
STATIC	-	3LG	BC0
TB	-	7C0	
TEREC	-	8C0	
TSREC	-	8C0	
TWER	-	8C0	
WINF	-	5C0	
WPHT	-	5C0	
WPE	-	5C0	

```

1      SUBROUTINE PRT1
2      IMPLICIT REAL (A-H,O-Z,M)
3      LOGICAL LIST1,STATIC
4      LOGICAL ERR
5      COMMON/BLK001/IRKT01,IRKT02,ERR,IN
6      COMMON/BLK004/ DTR,DTE,MC(30),AL,AK(15),CK(10),PCBT,ARFTR,ARETE, RATES
1      SIBNL,SIBT,ETARY,ORT,WPRT,DPB,DPE,AMALFE,CLAME,GAIE,WINE,WPE, RATES
2      OK(10),PAMBT,PEXBT,PEXIT
7      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE ALL
8      COMMON/BLK008/ ATR(50),AFSRM(50), MPNOM,TB,NMP,NTR FSCAL
9      COMMON/BLK009/ MITOT,MPTOT,SEI,AMIRR(10),AMPRR(10),DELT,MPR,MIZ INFRT
10     COMMON/BLK010/ NP(30)
11     COMMON/BLK021/ TSREC,TFREC,CSBAR,PNSBAR,TWEB,PITH,CSCOE(3),LIST1,
      $ STATIC
12     COMMON/BLK025/ NTAPE,NPLOT,NCARD
13     COMMON/BLK027/ DISLIM(20),MITSAV,SETFLG
14     NCOUT=NCASF+1
15     WRITE(6,10) NCOUT
16     10 FORMAT(' ',T21,'THFSE ARE THE INITIAL VALUES FOR CASE',I3,/)
17     WRITE(6,15)
18     15 FORMAT(' ',T31,'PROGRAM CONSTANTS',/,/, ' ',3X,'MOTOR CONSTANTS',10X,
      $ 'CURVE FIT CONSTANTS',11X,'ODD CONSTANTS',/)
19     DO 50 I=1,23
20     IF(I.GT.15) GO TO 35
21     IF(I.GT.12) GO TO 30
22     IF(I.GT.5) GO TO 25
23     WRITE(6,20) I,MC(I),I,AK(I),I,OK(I)
24     20 FORMAT(' MC(',I2,')=',G15.8,5X,'AK(',I2,')=',G15.8,5X,'OK(',I1,')=
      $ ',G15.8)
25     GO TO 50
26     25 IF(I.EQ.11) GO TO 290
27     WRITE(6,28) I,MC(I),I,AK(I)
28     28 FORMAT(' MC(',I2,')=',G15.8,5X,'AK(',I2,')=',G15.8)
29     29 FORMAT(' MC(',I2,')=',G15.8,5X,'AK(',I2,')=',G15.8, 8X,'DISPERSION
      $ LIMITS')
30     GO TO 50
31     290 WRITE(6,29) I,MC(I),I,AK(I)
32     GO TO 50
33     30 L=1-12
34     WRITE(6,32) I,MC(I),L,CSCOE(L),L,DISLIM(L)
35     32 FORMAT(' MC(',I2,')=',G15.8,5X,'CSCOE(',I1,')=',G15.8,5X,'DISLIM(
      $ ',I2,')=',G15.8)
36     GO TO 50
37     35 L=L+1
38     IF(I.EQ.16) WRITE(6,36) I,MC(I),L,DISLIM(L)
39     36 FORMAT(' MC(',I2,')=',G15.8,35X,'DISLIM(',I2,')=',G15.8)
40     IF(I.EQ.17) WRITE(6,38) I,MC(I),L,DISLIM(L)
41     38 FORMAT(' MC(',I2,')=',G15.8,6X,'UNIVERSAL CONSTANTS',10X,'DISLIM(
      $ ',I2,')=',G15.8)
42     IF(I.GT.21) GO TO 40
43     IF(I.LT.18) GO TO 50
44     LL=I-17
45     WRITE(6,39) I,MC(I),LL,CR(LL),L,DISLIM(L)
46     39 FORMAT(' MC(',I2,')=',G15.8,5X,'CK(',I1,')=',G15.8,9X,'DISLIM(
      $ ',I2,')=',G15.8)

```

```

47      GO TO 50
48      40 WRITE(6,36) I,MC(I),L,DISLIN(L)
49      50 CONTINUE
50      WRITE(6,55)
51      55 FORMAT(/'GENERAL PROGRAM INDICATORS',20X,'INERT MASS SCHEDULE'/
52      $ ' ',44X,'AMPRR',15X,'AMIRR'/)
53      WRITE(6,60) CLAME,AMPRR(01),AMIRR(01)
54      60 FORMAT(' CLAME =',F10.5,27X,G15.8,5X,G15.8)
55      WRITE(6,61) DPR,AMPRR(02),AMIRR(02)
56      61 FORMAT(' DPR =',F10.5,27X,G15.8,5X,G15.8)
57      WRITE(6,62) DPE,AMPRR(03),AMIRR(03)
58      62 FORMAT(' DPE =',F10.5,27X,G15.8,5X,G15.8)
59      WRITE(6,63) LIST1,AMPRR(04),AMIRR(04)
60      63 FORMAT(' LIST1 =',L10,27X,G15.8,5X,G15.8)
61      WRITE(6,64) NCARD,AMPRR(05),AMIRR(05)
62      64 FORMAT(' NCARD =',I10,27X,G15.8,5X,G15.8)
63      WRITE(6,65) NCASES,AMPRR(06),AMIRR(06)
64      65 FORMAT(' NCASES =',I10,27X,G15.8,5X,G15.8)
65      WRITE(6,66) NDISP,AMPRR(07),AMIRR(07)
66      66 FORMAT(' NDISP =',I10,27X,G15.8,5X,G15.8)
67      WRITE(6,67) NF,AMPRR(08),AMIRR(08)
68      67 FORMAT(' NF =',I10,27X,G15.8,5X,G15.8)
69      WRITE(6,68) NLEWIS,AMPRR(09),AMIRR(09)
70      68 FORMAT(' NLEWIS =',I10,27X,G15.8,5X,G15.8)
71      WRITE(6,69) NMP,AMPRR(10),AMIRR(10)
72      69 FORMAT(' NMP =',I10,27X,G15.8,5X,G15.8)
73      WRITE(6,690) NPLLOT
74      690 FORMAT(' NPLLOT =',I10)
75      WRITE(6,691) NRECON
76      691 FORMAT(' NRECON =',I10)
77      WRITE(6,692) NSI
78      692 FORMAT(' NSI =',I10)
79      WRITE(6,693) NTAPE
80      693 FORMAT(' NTAPE =',I10)
81      WRITE(6,694) NTH
82      694 FORMAT(' NTH =',I10)
83      WRITE(6,695) SIBT
84      695 FORMAT(' SIBT =',F10.5)
85      WRITE(6,70) SII
86      70 FORMAT(/' OPTIONAL PRINT INDICATORS',20X,'INERT MASS ISP(SII) =',
87      $ ' ',G15.8)
88      WRITE(6,72) IRKT01,MITOT
89      72 FORMAT(' IRKT01 =',I3,34X,'TOTAL INERT MASS(MITOT) =',G15.8)
90      IF(NF.NE.0) GO TO 100
91      WRITE(6,10) NCOUT
92      100 RETURN
93      100 END
94      82 FORMAT(' ',I2,3X,G15.8,3X,G15.8)
95      WRITE(6,84) TB,MPTOT,MPNOM
96      84 FORMAT(77,' TB =',G15.8,' MPTOT =',G15.8,' MPNOM =',G15.8)
97      100 RETURN
98      END

```


SYMBOL	REFERENCES
10	15WR 16* 89WR
15	17WR 18*
20	23WR 24*
25	22 26*
28	27WR 28*
29	29* 31WR
30	21 33*
32	34WR 35*
35	20 37*
36	38WR 39* 48WR
38	40WR 41*
39	45WR 46*
40	42 48*
50	19DO 25 30 32 36 43 47 49*
55	50WR 51*
60	52WR 53*
61	54WR 55*
62	56WR 57*
63	58WR 59*
64	60WR 61*
65	62WR 63*
66	64WR 65*
67	66WR 67*
68	68WR 69*
69	70WR 71*
70	84WR 85*
72	86WR 87*
80	90WR 91*
82	93WR 94*
84	95WR 96*
100	88 97*
290	26 31*
690	72WR 73*
691	74WR 75*
692	76WR 77*
693	78WR 79*
694	80WR 81*
695	82WR 83*
AFSRM	8CO 93WR
AHALFE	6CO
AK	6CO 23WR 27WR 31WR
AL	6CO
AMIRH	9CO 52WR 54WR 56WR 58WR 60WR 62WR 64WR 66WR 68WR 70WR
AMPRH	9CO 52WR 54WR 56WR 58WR 60WR 62WR 64WR 66WR 68WR 70WR
ARETB	6CO
ARETE	6CO
ATB	8CO 93WR
* BLK001	5*
* BLK004	6*
* BLK005	7*
* BLK008	8*
* BLK009	9*
* BLK010	10*

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SUBROUTINE PRT1

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SETFLG	-	1300	
SIBNL	-	600	
SIBT	-	600	82WR
SII	-	900	84WR
STATIC	-	3LG	1100
TR	-	800	95WR
TEREC	-	1100	
TSRFC	-	1100	
TWER	-	1100	
WINF	-	600	
WPBT	-	600	
WPE	-	600	

```

1      SUBROUTINE PRT2
2      IMPLICIT REAL (A-H,O-Z,M)
3      LOGICAL LIST1,STATIC
4      DIMENSION A(3)
5      DATA A/9.80665,0.45359237,0.3048/
6      COMMON/BLK004/ DTB,DTE,MC(30),AL,AK(15),CK(10),PCBT,ARFTB,ARETE, HATES
          1 SIBNL,SIBT,ETART,GBT,WPRT,DPB,DPE,AHALFE,CLAME,QAIE,WINE,WPE, RATES
          2 OK(10),PAMBT,PEXRT,PEXIT
7      COMMON/BLK013/ CSTAR,SIAE,SIDE,WD1,ETANZ,CSTAR2,SIACON,ETANZ2, OUTPUT
          3 CLAME2,STRAT,SILDVB,SILQB,SIL2PB,SIAS,SILDVE,SILQE,SIL2PE OUTPUT
8      COMMON/BLK021/ TSREC,TEREC,CSBAR,PNSBAR,TWEB,PITW,CSCOE(3),LIST1,
          4 STATIC
9      200 WRITE(6,205)
10     205 FORMAT(1H1,T10,'THESE ARE THE VALUES FROM THE SPECIFIC IMPULSE SCA
          1 SLING MODULE'//T20,'PARAMETER',25X,'INTERNATIONAL',4X,'ENGLISH')
11     TERM=SIAE*A(1)
12     WRITE(6,210) TERM,SIAE
13     210 FORMAT('0END ITEM ANALYTICAL SPECIFIC IMPULSE, SIAE(M/S,S) ',
          2 $G15.8,1X,G15.8)
14     TERM=SIDE*A(1)
15     WRITE(6,215) TERM,SIDE
16     215 FORMAT('0DELIVERED END ITEM SPECIFIC IMPULSE, SIDE(M/S,S) ',
          3 $G15.8,1X,G15.8)
17     TERM=WD1*A(2)
18     WRITE(6,220) TERM,WD1
19     220 FORMAT('0END ITEM FLOWRATE, WD1 (KG/S,LBM/S) ',
          4 $G15.8,1X,G15.8)
20     WRITE(6,225) ETANZ
21     225 FORMAT('0END ITEM NOZZLE EFFICIENCY, ETANZ ',
          5 $G15.8,1X,G15.8)
22     WRITE(6,230) CLAME
23     230 FORMAT('0DIVERGENCE CORRECTION FOR NOZZLE, CLAME ',
          6 $G15.8,1X,G15.8)
24     TERM=CSTAR2*A(3)
25     WRITE(6,235) TERM,CSTAR2
26     235 FORMAT('0THEO. PROPELLANT CSTAR AT PCAVE, CSTAR2(M/S,FT/S) ',
          7 $G15.8,1X,G15.8)
27     TERM=CSTAR*A(3)
28     WRITE(6,240) TERM,CSTAR
29     240 FORMAT('0PREDICTED END ITEM CSTAR, CSTAR(M/S,FT/S) ',
          8 $G15.8,1X,G15.8)
30     WRITE(6,250) CSCOE(1)
31     250 FORMAT('0CSTAR CURVE FIT COEFFICIENT NO. 1 ',
          9 $G15.8,1X,G15.8)
32     WRITE(6,260) CSCOE(2)
33     260 FORMAT('0CSTAR CURVE FIT COEFFICIENT NO. 2 ',
          0 $G15.8,1X,G15.8)
34     WRITE(6,270) CSCOE(3)
35     270 FORMAT('0CSTAR CURVE FIT COEFFICIENT NO. 3 ',
          1 $G15.8,1X,G15.8)
36     RETURN
37     END

```

SYMBOL	-----	REFERENCES	-----
200	- 9*		
205	- 9WR	10*	
210	- 12WR	13*	
215	- 15WR	16*	
220	- 18WR	19*	
225	- 20WR	21*	
230	- 22WR	23*	
235	- 25WR	26*	
240	- 28WR	29*	
250	- 30WR	31*	
260	- 32WR	33*	
270	- 34WR	35*	
A	- 401	5DA	11 14 17 24 27
AHALFE	- 6C0		
AK	- 6C0		
AL	- 6C0		
ARETH	- 6C0		
ARETE	- 6C0		
* BLK004	- 6*		
* BLK013	- 7*		
* BLK021	- 8*		
CK	- 6C0		
CLAME	- 6C0	22WR	
CLAME2	- 7C0		
CSBAR	- 8C0		
CSCDEF	- 8C0	30WR	32WR 34WR
CSTAR	- 7C0	27	28WR
CSTAR2	- 7C0	24	25WR
DPH	- 6C0		
DPE	- 6C0		
DTB	- 6C0		
DTL	- 6C0		
ETAHT	- 6C0		
ETANZ	- 7C0	20WR	
ETANZ2	- 7C0		
LIST1	- 3LG	8C0	
MC	- 6C0		
OK	- 6C0		
PAMBT	- 6C0		
PCHT	- 6C0		
PEXR1	- 6C0		
PEXIT	- 6C0		
PITW	- 8C0		
PNSBAR	- 8C0		
* PRT2	- 1*		
QAIE	- 6C0		
QBT	- 6C0		
* RETURN	- 36*		
SIACON	- 7C0		
SIAE	- 7C0	11	12WR
SIAS	- 7C0		
SIBAT	- 7C0		
SIBNL	- 6C0		

I N D E X

SUBROUTINE PRT2

PAGE 02

SIHT	-	6C0																
SIUF	-	7C0	14		15WR													
SIL0VB	-	7C0																
SIL0VF	-	7C0																
SIL0B	-	7C0																
SIL0E	-	7C0																
SIL2PB	-	7C0																
SIL2PE	-	7C0																
STATIC	-	3L6		8C0														
TEHEC	-	8C0																
TERM	-	11E	12WR	14E	15WR	17E	18WR	24E	25WR	27E	28WR							
TSRFC	-	8C0																
TWEB	-	8C0																
WD1	-	7C0	17		18WR													
WINE	-	6C0																
WPBT	-	6C0																
WPE	-	6C0																

```

1      SUBROUTINE PRT3
2      IMPLICIT REAL (A-H,O-Z,M)
3      LOGICAL LIST1,STATIC
4      DIMENSION A(3)
5      DATA A/9.80665,0.45359237,0.3048/
6      COMMON/BLK004/ DTB,DTE,MC(30),AL,AK(15),CK(10),PCBT,ARETB,ARETE, HATES
1      SIBNL,SIBT,ETABT,ONT,WPT,DPR,DPE,AHALFE,CLAME,OAIE,WINF,WPE, HATES
2      OK(10),PAMBT,PEXBT,PEXIT
7      COMMON/BLK007/ SICON,PCT,ARET,PAMT,AHALF1,WD2,PCAVE CDSI
8      COMMON/BLK013/ CSTAR,SIAE,SIDE,WD1,ETANZ,CSTAR2,SIACON,ETANZ2, OUTPUT
9      CLAME2,SIRAT,SILDVH,SILOR,SIL2PB,SIA5,SILDOE,SILOE,SIL2PE OUTPUT
10     COMMON/BLK021/ TSREC,TERFC,CSBAR,PNSBAR,TWEB,PITW,CSCOFF(3),LIST1,
11     $ STATIC
10    300 WRITE(6,305)
11    305 FORMAT(1H1,T5,'THESE ARE THE VALUES FROM THE CONTRACTOR DATA SPECI
      SFIC IMPULSF MODULE'//T20,'PARAMETER',27X,'INTERNATIONAL',4X,'ENGLI
      SSH')
12     TERM=SIACON*A(1)
13     WRITE(6,310) TERM,SIACON
14    310 FORMAT('OCONTRACTOR ANALYTICAL SPECIFIC IMPULSF, SIACON(M/S,S)',
      $G15.8,1X,G15.8)
15     TERM=SIAE*A(1)
16     WRITE(6,315) TERM,SIAE
17    315 FORMAT('OEND ITEM ANALYTICAL SPECIFIC IMPULSE, SIAE(M/S,S)',
      $G15.8,1X,G15.8)
18     TERM=SIDE*A(1)
19     WRITE(6,320) TERM,SIDE
20    320 FORMAT('ODELIVERED END ITEM SPECIFIC IMPULSE, SIDE(M/S, S)',
      $G15.8,1X,G15.8)
21     TERM=WD1*A(2)
22     WRITE(6,325) TERM,WD1
23    325 FORMAT('OEND ITEM FLOWRATE, WDE (KG/S,LBM/S)',
      $G15.8,1X,G15.8)
24     TERM=WD2*A(2)
25     WRITE(6,330) TERM,WD2
26    330 FORMAT('OEST MOTOR FLOWRATE, WD2 (KG/S,LHM/S)',
      $G15.8,1X,G15.8)
27     WRITE(6,335) ETANZ
28    335 FORMAT('OEND ITEM NOZZLE EFFICIENCY, ETANZ',
      $G15.8,1X,G15.8)
29     WRITE(6,340) ETANZ2
30    340 FORMAT('OEST MOTOR NOZZLE EFFICIENCY, ETANZ1',
      $G15.8,1X,G15.8)
31     WRITE(6,345) CLAME
32    345 FORMAT('ODIVERGENCE CORRECTION FOR NOZZLE, CLAME',
      $G15.8,1X,G15.8)
33     WRITE(6,350) CLAME2
34    350 FORMAT('ODIVERGENCE CORRECTION FOR NOZZLE, CLAM1',
      $G15.8,1X,G15.8)
35     TERM=CSTAR*A(3)
36     WRITE(6,360) TERM,CSTAR
37    360 FORMAT('OEND ITEM CSTAR, CSTAR(M/S,FT/S)',
      $G15.8,1X,G15.8)
38     WRITE(6,370) CSCOFF(1)
39    370 FORMAT('OCSTAR CURVE FIT COEFFICIENT NO. 1',

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I N D E X

SUBROUTINE PRT3

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```
      $G15.8,1X,G15.8)
40      WRITE(6,380) CSCDEF(2)
41      380 FORMAT('OCSTAR CURVE FIT COEFFICIENT NO. 2',
      $G15.8,1X,G15.8)
42      WRITE(6,390) CSCDEF(3)
43      390 FORMAT('OCSTAR CURVE FIT COEFFICIENT NO. 3',
      $G15.8,1X,G15.8)
44      RETURN
45      END
```


SYMBOL	-----	REFERENCES	-----
300	"	10*	
305	"	10WR	11*
310	"	13WR	14*
315	"	16WR	17*
320	"	19WR	20*
325	"	22WR	23*
330	"	25WR	26*
335	"	27WR	28*
340	"	29WR	30*
345	"	31WR	32*
350	"	33WR	34*
360	"	36WR	37*
370	"	38WR	39*
380	"	40WR	41*
390	"	42WR	43*
A	"	4DI	5DA
AHALFE	"	6CO	12
AHALFI	"	7CO	15
AK	"	6CO	18
AL	"	6CO	21
ARET	"	7CO	24
ARETB	"	6CO	
ARETE	"	6CO	
* BLK004	"	6*	
* BLK007	"	7*	
* BLK013	"	8*	
* BLK021	"	9*	
CK	"	6CO	
CLAME	"	6CO	31WR
CLAME2	"	8CO	33WR
CSBAR	"	9CO	
CSCDEF	"	9CO	38WR
CSTAR	"	8CO	40WR
CSTAR2	"	8CO	42WR
DPB	"	6CO	
DPE	"	6CO	
DTB	"	6CO	
DTE	"	6CO	
ETART	"	6CO	
ETANZ	"	8CO	27WR
ETANZ2	"	8CO	29WR
LIST1	"	3LG	9CO
MC	"	6CO	
OK	"	6CO	
PAMRT	"	6CO	
PAMT	"	7CO	
PCAVE	"	7CO	
PCBT	"	6CO	
PCT	"	7CO	
PEXRT	"	6CO	
PEXIT	"	6CO	
PITW	"	9CO	
PNSRAR	"	9CO	

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1  SUBROUTINE PRT4
2  IMPLICIT REAL (A-H,O-Z,M)
3  LOGICAL LIST1,STATIC
4  DIMENSION A(3)
5  DATA A/9.80665,0.45359237,0.3048/
6  COMMON/BLK004/ DTR,DTE,MC(30),AL,AK(15),CK(10),PCBT,ARETB,ARETF, BATES
   1 SIBNL,SIBT,ETABT,ORT,WPRT,DPB,DPE,AHALFE,CLAME,QATE,WINE,WPR, BATES
   2 OK(10),PAMBT,PEXBT,PEXIT
7  COMMON/BLK013/ CSTAR,SIAE,SIDE,WDI,ETANZ,CSTAR2,SIACON,ETANZ2, OUTPUT
   1 CLAME2,SIRAT,SILDVB,SILQB,SIL2PB,SIAS,SILDVE,SILQE,SIL2PF OUTPUT
8  COMMON/BLK021/ TSREC,TEREC,CSBAR,PNSBAR,TWEB,PITW,CSCOFF(3),LIST1,
   1 $ STATIC
9  400 WRITE(6,405)
10 405 FORMAT(1H1,T11,'THESE ARE THE VALUES FROM THE BATES SPECIFIC IMPUL
   1 SSE MODULE',//T20,'PARAMETER',30X,'INTERNATIONAL',4X,'ENGLISH')
11  TERM=SIBAT*A(1)
12  WRITE(6,410) TERM,SIRAT
13 410 FORMAT('0BATES TEST ANALYTICAL SPECIFIC IMPULSE, SIBAT(M/S,S) ',
   1 $G15.8,1X,G15.8)
14  TERM=SIBT*A(1)
15  WRITE(6,415) TERM,SIRAT
16 415 FORMAT('0BATES TEST SPECIFIC IMPULSE, SIBT(M/S,S) ',
   1 $G15.8,1X,G15.8)
17  TERM=SILDVB*A(1)
18  WRITE(6,420) TERM,SILDVB
19 420 FORMAT('0BATES SPECIFIC IMPULSE DIVERGENCE LOSS, SILDVB(M/S,S) ',
   1 $G15.8,1X,G15.8)
20  TERM=SILQB*A(1)
21  WRITE(6,425) TERM,SILQB
22 425 FORMAT('0BATES SPECIFIC IMPULSE HEAT LOSS, SILQB(M/S,S) ',
   1 $G15.8,1X,G15.8)
23  TERM=SIL2PB*A(1)
24  WRITE(6,430) TERM,SIL2PB
25 430 FORMAT('0BATES SPECIFIC IMPULSE 2 PHASE FLOWLOSS, SIL2PB(M/S,S) ',
   1 $G15.8,1X,G15.8)
26  TERM=SIBNL*A(1)
27  WRITE(6,435) TERM,SIBNL
28 435 FORMAT('0BATES NO LOSS SPECIFIC IMPULSE, SIBNL(M/S,S) ',
   1 $G15.8,1X,G15.8)
29  TERM=SIAS*A(1)
30  WRITE(6,440) TERM,SIAS
31 440 FORMAT('0STANDARD ANALYTICAL SPECIFIC IMPULSE, SIAS(M/S,S) ',
   1 $G15.8,1X,G15.8)
32  TERM=SIAE*A(1)
33  WRITE(6,445) TERM,SIAE
34 445 FORMAT('0END ITEM ANALYTICAL SPECIFIC IMPULSE, SIAE(M/S,S) ',
   1 $G15.8,1X,G15.8)
35  TERM=SILDVE*A(1)
36  WRITE(6,450) TERM,SILDVE
37 450 FORMAT('0END ITEM SPECIFIC IMPULSE DIVERGENCE LOSS,SILDVE(M/S,S)',
   1 $G15.8,1X,G15.8)
38  TERM=SILQE*A(1)
39  WRITE(6,455) TERM,SILQE
40 455 FORMAT('0END ITEM SPECIFIC IMPULSE HEAT LOSS, SILQE(M/S,S) ',
   1 $G15.8,1X,G15.8)

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```
41      TERM=SIL2PF*A(1)
42      WRITE(6,460) TERM,SIL2PE
43      460 FORMAT('0END ITEM SPEC. IMP. 2 PHASE FLOWLOSS, SIL2PE(M/S,S)
44      $G15.8,1X,G15.8)
45      TERM=SIDE*A(1)
46      WRITE(6,465) TERM,SIDE
47      465 FORMAT('0DELIVERED END ITEM SPECIFIC IMPULSE, SIDE(M/S,S)
48      $G15.8,1X,G15.8)
49      TERM=CSTAR*A(3)
50      WRITE(6,475) TERM,CSTAR
51      475 FORMAT('0CHARACTERISTIC EXHAUST VELOCITY, CSTAR(M/S,FT/S)
52      $G15.8,1X,G15.8)
53      WRITE(6,480) CSCOEFF(1)
54      480 FORMAT('0CSTAR CURVE FIT COEFFICIENT NO. 1
55      $G15.8,1X,G15.8)
56      WRITE(6,485) CSCOEFF(2)
57      485 FORMAT('0CSTAR CURVE FIT COEFFICIENT NO. 2
58      $G15.8,1X,G15.8)
59      WRITE(6,490) CSCOEFF(3)
60      490 FORMAT('0CSTAR CURVE FIT COEFFICIENT NO. 3
61      $G15.8,1X,G15.8)
62      RETURN
63      END
```

SYMBOL	-----	REFERENCES	-----
400	-	9*	
405	-	9WR	10*
410	-	12WR	13*
415	-	15WR	16*
420	-	18WR	19*
425	-	21WR	22*
430	-	24WR	25*
435	-	27WR	28*
440	-	30WR	31*
445	-	33WR	34*
450	-	36WR	37*
455	-	39WR	40*
460	-	42WR	43*
465	-	45WR	46*
470	-	47WR	48*
475	-	50WR	51*
480	-	52WR	53*
485	-	54WR	55*
490	-	56WR	57*
A	-	4DI	50A
	-	44	49
AHALFF	-	6C0	
AK	-	6C0	
AL	-	6C0	
ARETH	-	6C0	
ARETE	-	6C0	
* BLK004	-	6*	
* BLK013	-	7*	
* BLK021	-	8*	
CK	-	6C0	
CLAME	-	6C0	47WR
CLAME2	-	7C0	
CSBAR	-	8C0	
CSCDEF	-	8C0	52WR
CSTAR	-	7C0	49
CSTAR2	-	7C0	54WR
DPB	-	6C0	56WR
DPE	-	6C0	
DTB	-	6C0	
DTE	-	6C0	
ETART	-	6C0	
ETANZ	-	7C0	
ETANZ2	-	7C0	
LIST1	-	3LG	8C0
MC	-	6C0	
OK	-	6C0	
PAMRT	-	6C0	
PCBT	-	6C0	
PEXBT	-	6C0	
PEXT	-	6C0	
PITW	-	8C0	
PNSBAR	-	8C0	
* PRT4	-	1*	

I N D E X

SUBROUTINE PRT4 .

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```

*  UAIE      - 6CO
   QBT       - 6CO
   RETURN    - 58*
   SIACON    - 7CO
   SIAF      - 7CO 32 33WR
   SIAS      - 7CO 29 30WR
   SIBAT     - 7CO 11 12WR
   SIBNL     - 6CO 26 27WR
   SIBT      - 6CO 14 15WR
   SIDF      - 7CO 44 45WR
   SILOVB    - 7CO 17 18WR
   SILOVE    - 7CO 35 36WR
   SILOB     - 7CO 20 21WR
   SILOE     - 7CO 38 39WR
   SIL2PH    - 7CO 23 24WR
   SIL2PE    - 7CO 41 42WR
   STATIC    - 3LG 8CO
   TERE      - 8CO
   TERM      - 11= 12WR 14= 15WR 17= 18WR 20= 21WR 23= 24WR 26= 27WR 29=
                30WR 32= 33WR 35= 36WR 38= 39WR 41= 42WR 44= 45WR 49= 50WR
   ISREC     - 8CO
   TWEH      - 8CO
   WDL       - 7CO
   WINE      - 6CO
   WPBT      - 6CO
   WPE       - 6CO

```

```

1      SUBROUTINE PRT5
2      IMPLICIT REAL (A-H,O-Z,M)
3      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE
4      WRITE(6,1)
5      1 FORMAT('1',T10,'THESE ARE THE DISPERSION VALUES FOR THIS CASE')
6      WRITE(6,5) NDISP
7      5 FORMAT('0',T18,'NDISP = ',I2///)
8      WRITE(6,10)
9      10 FORMAT(' NDISP= 1 : + PROPELLANT DENSITY           '//,
1     ' NDISP= 2 : - PROPELLANT DENSITY           '//,
2     ' NDISP= 3 : + PRESSURE EXPONENT             '//,
3     ' NDISP= 4 : - PRESSURE EXPONENT             '//,
4     ' NDISP= 5 : + PRESSURE COEFFICIENT           '//,
5     ' NDISP= 6 : - PRESSURE COEFFICIENT           '//,
6     ' NDISP= 7 : + CHARACTERISTIC VELOCITY       '//,
7     ' NDISP= 8 : - CHARACTERISTIC VELOCITY       '//,
8     ' NDISP= 9 : + PROPELLANT GRAIN LENGTH -     '//,
9     ' NDISP=10 : - PROPELLANT GRAIN LENGTH       '//,
A     ' NDISP=11 : + PROPELLANT GRAIN WEB THICKNESS '//,
B     ' NDISP=12 : - PROPELLANT GRAIN WEB THICKNESS '//,
C     ' NDISP=13 : + INITIAL THROAT DIAMETER       '//,
D     ' NDISP=14 : - INITIAL THROAT DIAMETER       '//,
E     ' NDISP=15 : + INITIAL EXIT DIAMETER         '//,
F     ' NDISP=16 : - INITIAL EXIT DIAMETER         '//,
G     ' NDISP=17 : + THROAT EROSION RATE (RADIUS)  '//,
H     ' NDISP=18 : - THROAT EROSION RATE (RADIUS)  '//,
I     ' NDISP=19 : + PROPELLANT GRAIN TEMPERATURE '//,
J     ' NDISP=20 : - PROPELLANT GRAIN TEMPERATURE ')
10     WRITE(6,20)
11     20 FORMAT(' NDISP=21 : + INITIAL INERT MASS CONSUMABLE '//,
1     ' NDISP=22 : - INITIAL INERT MASS CONSUMABLE ')
12     WRITE(6,30)
13     30 FORMAT('///DISPERSED PARAMETER(S) :')
14     RETURN
15     END

```

C-2

C-2

C-2

C-2


```

1      SUBROUTINE PRT6
2      IMPLICIT REAL (A-H,O-Z,M)
3      DIMENSION A(5)
4      DATA A/9.80665,0.45359237,0.3048,4.4482216,689475.729/
5      COMMON/BLK008/ ATB(50),AFSRM(50), MPNOM,TB,NMP,NTR
6      COMMON/BLK009/ MITOT,MPTOT,STI,AMIRR(10),AMPRR(10),DELT,MPR,MIZ
7      COMMON/BLK013/ CSTAR,SJAE,SIDE,WDE,ETANZ,CSTAR2,SIACON,ETANZ1,
8      $ CLAM1, SIBAT,SILDVB,SILOR,SIL2PR,SIAS,SILDVE,SILOE,SIL2PE
9      COMMON/BLK014/ TPN,FSRM,MFSRM,PC
10     COMMON/BLK016/ MFINIT,F1,MIF,MIFZ,MIR,FIZ,AITIN,AITVIN
11     COMMON/BLK019/ NL600
12     IF(NL600.LE.32) GO TO 610
13     NL600=0
14     WRITE(6,605)
15     605 FORMAT('1',T10,'THESE ARE THE VALUES FROM THE THRUST SCALING MODUL
16     $E,/')
17     610 WRITE(6,615) TPN
18     615 FORMAT('0SRM IGNITION TIME: TPN(S):,10X,G15.8//T11,'VEHICLE PARAME
19     $TERS',29X,'INTERNATIONAL',4X,'ENGLISH')
20     DUM=FSRM*FI
21     TERM=DUM*A(4)
22     WRITE(6,620) TERM,DUM
23     620 FORMAT('1 SRM TOTAL THRUST, FSRM*FI(N,LBF)
24     $G15.8,1X,G15.8)
25     TERM=FI*A(4)
26     WRITE(6,622) TERM,FI
27     622 FORMAT('1 SRM INERT THRUST, FI(N,LBF)
28     $G15.8,1X,G15.8)
29     DUM=MFSRM*MIF
30     TERM=DUM*A(2)
31     WRITE(6,625) TERM,DUM
32     625 FORMAT('1 SRM TOTAL MASS FLOWRATE, MFSRM*MIF(KG/S, LBM/S)
33     $G15.8,1X,G15.8)
34     TERM=MIF*A(2)
35     WRITE(6,627) TERM,MIF
36     627 FORMAT('1 SRM INERT MASS FLOWRATE, MIF(KG/S,LBM/S)
37     $G15.8,1X,G15.8)
38     TERM=SIDE*A(1)
39     WRITE(6,630) TERM,SIDE
40     630 FORMAT('1 SRM PROPELLANT SPECIFIC IMPULSE, SIDE (M/S,S)
41     $G15.8,1X,G15.8)
42     TERM=SII*A(1)
43     WRITE(6,631) TERM,SII
44     631 FORMAT('1 SRM SPECIFIC IMPULSE OF INERTS, SII(M/S,S)
45     $G15.8,1X,G15.8)
46     SRMSI = (FSRM*FI)*ZERODV(MFSRM*MIF)
47     TERM=SRMSI*A(1)
48     WRITE(6,632) TERM,SRMSI
49     632 FORMAT('1 SRM SPECIFIC IMPULSE, SRMSI(M/S,S)
50     $G15.8,1X,G15.8)
51     TERM=MPR*A(2)
52     WRITE(6,635) TERM,MPR
53     635 FORMAT('1 SRM PROPELLANT MASS REMAINING, MPR (KG, LBM)
54     $G15.8,1X,G15.8)
55     TERM=MIR*A(2)

```

FSCAL
INERT
OUTPUT
OUTPUT
OUTPUT

0256-10020-4

```
45      WRITE(6,637) TERM,MIR
46      637 FORMAT(' SRM INERT MASS REMAINING, MIR(KG,LBM) ',
      $G15.8,1X,G15.8)
47      TERM=PC*A(5)
48      WRITE(6,640) TERM,PC
49      640 FORMAT(' SRM CHAMBER PRESSURE, PC (N/M**2, LBF/IN**2) ',
      $G15.8,1X,G15.8)
50      NL600 = NL600 + 14
51      RETURN
52      END
```



```

SIAE - - 7CO
SIAS - - 7CO
SIBAT - - 7CO
SIDE - - 7CO 31 32WR
SII - - 6CO 34 35WR
SILDVR - - 7CO
SILDVE - - 7CO
SILQB - - 7CO
SILQE - - 7CO
SIL2PB - - 7CO
SIL2PF - - 7CO
SHMS1 - - 37= 38 39WR
TH - - 5CO
TERM - - 18= 19WR 21= 22WR 25= 26WR 28= 29WR 31= 32WR 34= 35WR 38=
      39WR 41= 42WR 44= 45WR 47= 48WR
TPN - - 8CO 15WR
WDE - - 7CO
THE VARIABLE- ZERODV -IS USED BEFORE IT IS DEFINED
ZERODV - - 37

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1      SUBROUTINE PRT7
2      IMPLICIT REAL (A-H,O-Z,M)
3      DIMENSION A(10)
4      DATA A/9,80665,0,45359237,0,3048,4,4482210,689475,729,0,0254,
5      $ 0,00064516,0,55555556,16,387064E-8/
6      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP      ALL
7      COMMON/HLK009/ MITOT,MPTOT,STI,AMIRR(10),AMPRR(10),DELT,MPP,MIZ      INERT
8      COMMON/BLK016/ MFINIT,F1,MIF,MIFZ,MIR,FIZ,AITIN,AITVIN
9      COMMON/BLK025/ NTAPE,NPLOT,NCARD
10     COMMON/CONSTS/GNOT,PI,PIQ2,RADIAN
11     COMMON/INPUT6/CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
12     $ AMWG(20),TCOMR(20),NCSCOE
13     COMMON/INPUT1/AN2,CM,DE,DT,ANN
14     COMMON/INPUTU/DELF,PA,PHI,HCO,DELTZ,KDUMP(72)
15     COMMON/COMA/DELT,APHI,WDOT1,ANIBO,TIMEX,UT,ANLOPS,ACCEL,
16     $ ABCYL,PRNT(101,15),AINCHI,AMACH,ZCALC(101)
17     COMMON/COMR/AHH,AJPHN,AJRHN,TAJAO,AJPHEO,AJBHEO,AJPN07,AJBN0Z,
18     $ XBH,XBN,DTINT
19     COMMON/COMG/TAU7(101),RBZ(101),TAUZTO(101),RRZTO(101),PD(101),
20     $ TAUWOP(101),RB,VF,DWDOT,VP
21     COMMON/COMI/AITVAC,FVAC,VFCYL,CFPROP,FINDP
22     COMMON/COMW/DV,AEE,PEP01
23     COMMON/PARM6/AP,PHIN,PHAX,WDOT,III,IIJ,WDOTD,NSLOT,NTARE,NTME,
24     $ TAU0,TOFLAG,NINCP,BRNOUT,IIS,ISI,IS2,NI,SCUP(18,2)
25     COMMON/PARMF/PH,TJMF,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
26     $ AMW,AKRST
27     COMMON/PARMG/VFH,AAN,VFN,VIS,AIT,SPHDT,SPONDT,VFINV,VEH,ARTOT
28     COMMON/PARMI/AOMCYL,AIBCYL,AIPCYL,AKGYX,AKGYY,VPH,VPN
29     COMMON/PARMK/F,EPI,PEPO,CFOL,VFWEH,WD,DEED,CLOPS,CFO,WGTOT,
30     $ SWDOTN
31     COMMON/PARMV/WF
32     COMMON/PARMX/WFI,EPG
33     COMMON/PARMZ/ABSLOT,PO
34     DATA MMGROS,MMCASE,MNOZ,MIGN,MTVC,TGRAIN,AHALFC/7*0,0/
35     WRITE(6,10) TIME
36     10 FORMAT('IGNITION TIME, TIME (S)',10X,G15.8//T50,'PROGRAM'/T9,
37     $ 1*PARAMETER DESCRIPTION (UNITS)',T48,'NOMENCLATURE',T66,'INTERNAT10
38     $ 2NAL',T89,'ENGLISH'//T2,'MOTOR PARAMETERS:')
39     FTDEL=F*FI
40     TERM = FTDEL * A(4)
41     WRITE(6,20) TERM,FTDEL
42     20 FORMAT(T4,'TOTAL DELIVERED THRUST (N,LBF)',T51,'FTDEL',
43     $ T66,G15.8,T86,G15.8)
44     FTVAC=FVAC*FI
45     TERM = FTVAC * A(4)
46     WRITE(6,25) TERM,FTVAC
47     25 FORMAT(T4,'TOTAL VACUUM THRUST (N,LBF)',T51,'FTVAC',
48     $ T66,G15.8,T86,G15.8)
49     TERM = FI * A(4)
50     WRITE(6,30) TERM,FI
51     30 FORMAT(T4,'THRUST CONTRIBUTION OF INERTS (N,LBF)',T51,'FI',
52     $ T66,G15.8,T86,G15.8)
53     SRMDTI=AIT*AITIN
54     TERM = SRMDTI * A(4)
55     WRITE(6,35) TERM,SRMDTI

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43 --- 35 FORMAT(I4,'DELIVERED TOTAL IMPULSE (N*S,LBF*S)',T51,'SRMDTI',
      $ T66,G15.8,T86,G15.8)
44      SRMDTI=AITVAC + AITVIN
45      TERM = SRMDTI * A(4)
46 --- 40 WRITE(6,40) TERM,SRMDTI
47      40 FORMAT(I4,'VACUUM TOTAL IMPULSE (N*S,LBF*S)',T51,'SRMDTI',
      $ T66,G15.8,T86,G15.8)
48      CF = FTVAC/(AT*PON)
49      WRITE(6,45) CF,CF
50 --- 45 FORMAT(I4,'THRUST COEFFICIENT',T51,'CF',
      $ T66,G15.8,T86,G15.8)
51      TERM = WDOT * A(2)
52      WRITE(6,50) TERM,WDOT
53 --- 50 FORMAT(I4,'GRAIN DISCHARGE MASS FLOWRATE (KG/S,LBM/S)',T51,'WDOT',
      $ T66,G15.8,T86,G15.8)
54      TERM = SWDOTN * A(2)
55      WRITE(6,55) TERM,SWDOTN
56 --- 55 FORMAT(I4,'FLOWRATE INTEGRAL (KG,LBM)',T51,'SWDOTN',
      $ T66,G15.8,T86,G15.8)
57      TERM = MIF * A(2)
58      WRITE(6,60) TERM,MIF
59 --- 60 FORMAT(I4,'INERT MASS FLOWRATE (KG/S,LBM/S)',T51,'MIF',
      $ T66,G15.8,T86,G15.8)
60      TERM=MIR *A(2)
61      WRITE(6,63) TERM,MIR
62 --- 63 FORMAT(I4,'INERT MASS REMAINING (KG,LBM)',T51,'MIR',
      $ T66,G15.8,T86,G15.8)
63      TERM = ARTOT * A(7)
64 --- 65 WRITE(6,65) TERM,ARTOT
65 --- 65 FORMAT(I4,'TOTAL BURN AREA (M**2,IN**2)',T51,'ARTOT',
      $ T66,G15.8,T86,G15.8)
66      TERM = VF * A(9)
67      WRITE(6,70) TERM,VF
68 --- 70 FORMAT(I4,'TOTAL PROPELLANT VOLUME (M**3,IN**3)',T51,'VF',
      $ T66,G15.8,T86,G15.8)
69      TERM = WF * A(2)
70      WRITE(6,75) TERM,WF
71 --- 75 FORMAT(I4,'PROPELLANT MASS REMAINING (KG,LBM)',T51,'WF',
      $ T66,G15.8,T86,G15.8)
72      TERM = WGTOT * A(2)
73 --- 80 WRITE(6,80) TERM,WGTOT
74 --- 80 FORMAT(I4,'TOTAL GAS MASS (KG,LBM)',T51,'WGTOT',
      $ T66,G15.8,T86,G15.8)
75 --- 85 WRITE(6,85) GAMA,GAMA
76 --- 85 FORMAT(I4,'RATIO OF SPECIFIC HEATS',T51,'GAMA',
      $ T66,G15.8,T86,G15.8)
77 --- 90 TERM = AMW * A(2)
78      WRITE(6,90) TERM,AMW
79 --- 90 FORMAT(I4,'MOLECULAR WEIGHT OF GAS (KG/MOLE,LBM/MOLE)',T51,'AMW',
      $ T66,G15.8,T86,G15.8)
80      TERM = CSTAR * A(3)
81 --- 95 WRITE(6,95) TERM,CSTAR
82 --- 95 FORMAT(I4,'CHARACTERISTIC EXHAUST VELOCITY (M/S,FT/S)',T51,'CSTAR',
      $ T66,G15.8,T86,G15.8)
83 --- 100 WRITE(6,100) AMPN,AMPN

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84      100 FORMAT(T4,'MAXIMUM CHAMBER MACH NUMBER',T51,'AMPN',
      $ T66,G15.8,T86,G15.8)
85      WRITE(6,200)
86      200 FORMAT(/T2,'HEAD END PARAMETERS:')
87      TERM = PH * A(5)
88      WRITE(6,205) TERM,PH
89      205 FORMAT(T4,'TOTAL PRESSURE (N/M**2,LBF/IN**2)',T51,'PH',
      $ T66,G15.8,T86,G15.8)
90      TERM = SPHDT * A(5)
91      WRITE(6,210) TERM,SPHDT
92      210 FORMAT(T4,'PRESSURE INTEGRAL (N*S/M**2,LBF*S/IN**2)',T51,'SPHDT',
      $ T66,G15.8,T86,G15.8)
93      TERM = AHM * A(7)
94      WRITE(6,215) TERM,AHM
95      215 FORMAT(T4,'BURN AREA (M**2,IN**2)',T51,'AHM',
      $ T66,G15.8,T86,G15.8)
96      TERM = RBZ(1) * A(6)
97      WRITE(6,220) TERM,RBZ(1)
98      220 FORMAT(T4,'BURN RATE (M/S,IN/S)',T51,'RBZ(1)',
      $ T66,G15.8,T86,G15.8)
99      TERM = TAUZ(1) * A(6)
100     WRITE(6,225) TERM,TAUZ(1)
101     225 FORMAT(T4,'DISTANCE BURNED (M,IN)',T51,'TAUZ(1)',
      $ T66,G15.8,T86,G15.8)
102     TERM = VFH * A(9)
103     WRITE(6,230) TERM,VFH
104     230 FORMAT(T4,'PROPELLANT VOLUME (M**3,IN**3)',T51,'VFH',
      $ T66,G15.8,T86,G15.8)
105     TERM = VPH * A(9)
106     WRITE(6,235) TERM,VPH
107     235 FORMAT(T4,'GAS VOLUME (M**3,IN**3)',T51,'VPH',
      $ T66,G15.8,T86,G15.8)
108     TERM = PRNT(1,3) * A(8)
109     WRITE(6,240) TERM,PRNT(1,3)
110     240 FORMAT(T4,'GAS STATIC TEMPERATURE (DEG K,DEG R)',T51,'PRNT(1,3)',
      $ T66,G15.8,T86,G15.8)
111     WRITE(6,245)
112     245 FORMAT(/T2,'CYLINDRICAL SECTION PARAMETERS:')
113     TERM = ABCYL * A(7)
114     WRITE(6,250) TERM,ABCYL
115     250 FORMAT(T4,'RADIAL BURN AREA (M**2,IN**2)',T51,'ABCYL',
      $ T66,G15.8,T86,G15.8)
116     TERM = ABSLOT * A(7)
117     WRITE(6,255) TERM,ABSLOT
118     255 FORMAT(T4,'SEGMENT FACE BURN AREA (M**2,IN**2)',T51,'ABSLOT',
      $ T66,G15.8,T86,G15.8)
119     TERM = VFCYL * A(9)
120     WRITE(6,260) TERM,VFCYL
121     260 FORMAT(T4,'PROPELLANT VOLUME (M**3,IN**3)',T51,'VFCYL',
      $ T66,G15.8,T86,G15.8)
122     TERM = VP * A(9)
123     WRITE(6,265) TERM,VP
124     265 FORMAT(T4,'GAS VOLUME (M**3,IN**3)',T51,'VP',
      $ T66,G15.8,T86,G15.8)
125     WRITE(6,300)

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126 . 300 FORMAT(/T2,'AFT END PARAMETERS:')
127 .   TERM = PON * A(5)
128 .   WRITE(6,305) TERM,PON
129 . 305 FORMAT(T4,'TOTAL PRESSURE (NOZ ENT) (N/M**2,LBF/IN**2)',T51,'PON',
130 .   $ T66,G15.8,T86,G15.8)
131 .   TERM = SPONDT * A(5)
132 . 310 FORMAT(T4,'PRESSURE INTEGRAL (N*S/M**2,LBF*S/IN**2)',T51,'SPONDT',
133 .   $ T66,G15.8,T86,G15.8)
134 .   TERM = AAN * A(7)
135 . 315 FORMAT(T4,'BURN AREA (M**2,IN**2)',T51,'AAN',
136 .   $ T66,G15.8,T86,G15.8)
137 .   TERM = RBZ(NI+1) * A(6)
138 . 320 FORMAT(T4,'BURN RATE (M/S,IN/SEC)',T51,'RBZ(NI+1)',
139 .   $ T66,G15.8,T86,G15.8)
140 .   TERM = TAUZ(NI+1) * A(6)
141 . 325 FORMAT(T4,'DISTANCE BURNED (N,IN)',T51,'TAUZ(NI+1)',
142 .   $ T66,G15.8,T86,G15.8)
143 .   TERM = VFN * A(9)
144 . 330 FORMAT(T4,'PROPELLANT VOLUME (M**3,IN**3)',T51,'VFN',
145 .   $ T66,G15.8,T86,G15.8)
146 .   TERM = VPN * A(9)
147 . 335 FORMAT(T4,'GAS VOLUME (M**3,IN**3)',T51,'VPN',
148 .   $ T66,G15.8,T86,G15.8)
149 .   TERM = PRNT(NI,3) * A(8)
150 . 340 FORMAT(T4,'GAS STATIC TEMPERATURE (DEG K,DEG R)',T51,'PRNT(NI,3)',
151 .   $ T66,G15.8,T86,G15.8)
152 .   TERM = AP * A(7)
153 . 345 FORMAT(T4,'PORT AREA (M**2,IN**2)',T51,'AP',
154 .   $ T66,G15.8,T86,G15.8)
155 . 350 FORMAT(/T2,'NOZZLE PARAMETERS:')
156 .   TERM = AT * A(7)
157 . 355 FORMAT(T4,'THROAT AREA (M**2,IN**2)',T51,'AT',
158 .   $ T66,G15.8,T86,G15.8)
159 .   EPR = AE/AT
160 .   EPR = AE/AT
161 . 360 FORMAT(T4,'EXPANSION RATIO',T51,'EPR',
162 .   $ T66,G15.8,T86,G15.8)
163 .   TERM = PEPO/PEPO
164 . 365 FORMAT(T4,'PRESSURE RATIO',T51,'PEPO',
165 .   $ T66,G15.8,T86,G15.8)
166 . 370 FORMAT(/T2,'MISCELLANEOUS PARAMETERS:')
167 .   TERM = AKRST * A(7)
168 . 375 FORMAT(T4,'ANISOTROPIC BURN RATE COEFFICIENT',T51,'AKRST',

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169      $ T66,G15.8,T86,G15.8)
170      WRITE(6,380) ANLOPS,ANLOPS
380      FORMAT(T4,'NUMBER OF PRESSURE ITERATIONS',T51,'ANLOPS',
171      $ T66,G15.8,T86,G15.8)
172      IF(NRECON.EQ.0) GO TO 791
173      WRITE(6,385) CFPROP,CFPROP
385      FORMAT(T4,'INDICATED THRUST COEFFICIENT FROM RECON',T51,'CFPROP',
174      $ T66,G15.8,T86,G15.8)
175      TERM = FINDP * A(4)
176      WRITE(6,390) TERM,FINDP
390      FORMAT(T4,'INDICATED THRUST COEFFICIENT FROM RECON (N,LBF)',T51,
      $ 'FINDP',T66,G15.8,T86,G15.8)

C
C      WRITE DATA AND PLOT TAPE
C
177      791 WRD4 = FVAC*ZFRODV(WDOT)
178      WRD13= WFI-WF
179      IF(NTAPE.EQ.0) GO TO 792
180      WRITE(12) TIME,FVAC,AITVAC,WRD4,CSTAR,CFOL,PH,PON,PRNT(3,1),AT,
      $AMPN,WDOT,WRD13,WF,MIR,AEE,EPG
181      792 IF(NPLOT.EQ.0) GO TO 793
182      WRITE(13) TIME,FVAC,AITVAC,WRD4,CSTAR,CFOL,PH,PON,PRNT(3,1),AT,
      $AMPN,WDOT,WRD13,WF,MIR,AEE,EPG
183      793 IF(NCARD.EQ.0) GO TO 1000
184      WRITE(7,794) TIME,WF,MIR
185      794 FORMAT(F8.3,2F12.2)
186      1000 RETURN
187      ENTRY OUTTAP
188      END FILE 12
189      MPIT = WFI
190      WRITE(12) MITOT,NPIT,MMGROS,MMCASE,MNOZ,MIGN,MTVC,TGRAIN,DELF,
      $ AN2,AHALFC
191      END FILE 12
192      RETURN
193      END

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SYMBOL	-----	REFERENCES	-----
10	-	27WR	28*
20	-	31WR	32*
25	-	35WR	36*
30	-	38WR	39*
35	-	42WR	43*
40	-	46WR	47*
45	-	49WR	50*
50	-	52WR	53*
55	-	55WR	56*
60	-	58WR	59*
63	-	61WR	62*
65	-	64WR	65*
70	-	67WR	68*
75	-	70WR	71*
80	-	73WR	74*
85	-	75WR	76*
90	-	78WR	79*
95	-	81WR	82*
100	-	83WR	84*
200	-	85WR	86*
205	-	88WR	89*
210	-	91WR	92*
215	-	94WR	95*
220	-	97WR	98*
225	-	100WR	101*
230	-	103WR	104*
235	-	106WR	107*
240	-	109WR	110*
245	-	111WR	112*
250	-	114WR	115*
255	-	117WR	118*
260	-	120WR	121*
265	-	123WR	124*
300	-	125WR	126*
305	-	128WR	129*
310	-	131WR	132*
315	-	134WR	135*
320	-	137WR	138*
325	-	140WR	141*
330	-	143WR	144*
335	-	146WR	147*
340	-	149WR	150*
345	-	152WR	153*
350	-	154WR	155*
355	-	157WR	158*
360	-	161WR	162*
365	-	163WR	164*
370	-	165WR	166*
375	-	167WR	168*
380	-	169WR	170*
385	-	172WR	173*
390	-	175WR	176*
791	-	171	177*

I N D E X

SUBROUTINE PR17

PAGE 103

792	-	179	181*												
793	-	181	183*												
794	-	184WR	185*												
1000	-	183	186*												
A	-	30I	40A	30	34	37	41	45	51	54	57	60	63	66	
		69	72	77	80	87	90	93	96	99	102	105	108	113	
		116	119	122	127	130	133	136	139	142	145	148	151	156	
		174													
AAN	-	20CO	133	134WR											
ABCYL	-	13CO	113	114WR											
AHSL0T	-	25CO	116	117WR											
AHTOT	-	20CO	63	64WR											
ACCFL	-	13CO													
AE	-	159=	160												
AEE	-	17CO	180WR	182WR											
AHALFC	-	26DA	190WR												
AHH	-	14CO	93	94WR											
AIBCYL	-	21CO													
AINCHI	-	13CO													
AINCW	-	19CO													
AIPCYL	-	21CO													
AIT	-	20CO	40												
ATTIN	-	7CO	40												
ATTVAC	-	16CO	44	180WR	182WR										
ATTVIN	-	7CO	44												
AJHHED	-	14CO													
AJBHN	-	14CO													
AJBNOZ	-	14CO													
AJPHEO	-	14CO													
AJPHN	-	14CO													
AJPN0Z	-	14CO													
AKGY	-	19CO													
AKGYX	-	21CO													
AKGYY	-	21CO													
AKRST	-	19CO	167WR												
AMACH	-	13CO													
AMJRR	-	6CO													
AMPN	-	19CO	83WR	180WR	182WR										
AMPRR	-	6CO													
AMW	-	19CO	77	78WR											
AMWG	-	10CO													
AMIRO	-	13CO													
ANLOPS	-	13CO	169WR												
ANN	-	11CO													
AN2	-	11CO	190WR												
AOMCYL	-	21CO													
AP	-	18CO	151	152WR											
APHI	-	13CO													
AT	-	19CO	48	156	157WR	160	180WR	182WR							
BLK005	-	5*													
BLK009	-	6*													
BLK016	-	7*													
BLK025	-	8*													
BRNOUT	-	18CO													
CF	-	48=	49WR												

I N D E X

SUBROUTINE PART

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CFO	-	22CO					
CFOL	-	22CO	180WR	182WR			
CFPROP	-	16CO	172WR				
CLOPS	-	22CO					
CH	-	11CO					
* COMA	-	13*					
* COMB	-	14*					
* COMG	-	15*					
* COMI	-	16*					
* COMW	-	17*					
* CONSTS	-	9*					
CSTAR	-	10CO	80	81WR	180WR	182WR	
CSTR	-	10CO					
UE	-	11CO	159				
UEED	-	22CO					
UELF	-	12CO	190WR				
UELT	-	6CO					
DELTA	-	19CO					
DELTI	-	13CO					
DELZ	-	12CO					
DIS	-	19CO					
UT	-	11CO					
UTINT	-	14CO					
UV	-	17CO					
UWDOT	-	15CO					
EPG	-	24CO	180WR	182WR			
EPR	-	160*	161WR				
EPI	-	22CO					
F	-	22CO	29				
FI	-	7CO	29	33	37	38WR	
FINDP	-	16CO	174	175WR			
FIZ	-	7CO					
FTDEL	-	29*	30	31WR			
FTVAC	-	33*	34	35WR	48		
FVAC	-	16CO	33	177	180WR	182WR	
GAMA	-	10CO	75WR				
GAMAG	-	10CO					
GNOT	-	9CO					
HCO	-	12CO					
III	-	18CO					
IJJ	-	18CO					
IIS	-	18CO					
* INPUTG	-	10*					
* INPUTI	-	11*					
* INPUTU	-	12*					
IS1	-	18CO					
IS2	-	18CO					
KDUMP	-	12CO					
MFINIT	-	7CO					
MIF	-	7CO	57	58WR			
MIFZ	-	7CO					
MIGN	-	26DA	190WR				
MIR	-	7CO	50	61WR	180WR	182WR	184WR
MITOT	-	6CO	190WR				
MIZ	-	6CO					

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I N D E X

SUBROUTINE PRT7

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MMCASE	-	260A	190WR					
MMGROS	-	260A	190WR					
MNUZ	-	260A	190WR					
MPIT	-	189=	190WR					
MPR	-	6C0						
MPTOT	-	6C0						
MTVC	-	260A	190WR					
NCARD	-	8C0	183					
NCASES	-	5C0						
NCSCOF	-	10C0						
NCSTR	-	10C0						
NDISP	-	5C0						
NF	-	5C0						
NI	-	18C0	136	137WR	139	140WR	148	149WR
NINCPL	-	18C0						
NLEWIS	-	5C0						
NPLOT	-	8C0	181					
NRECUN	-	5C0	171					
NSI	-	5C0						
NSLOT	-	18C0						
NTARE	-	18C0						
NTAPE	-	8C0	179					
NTME	-	18C0						
* OUTTAP	-	187*						
P	-	19C0						
PA	-	12C0						
* PARMB	-	18*						
* PARMF	-	19*						
* PARMG	-	20*						
* PARMH	-	21*						
* PARMK	-	22*						
* PARMV	-	23*						
* PARMX	-	24*						
* PARMZ	-	25*						
PD	-	15C0						
PEPO	-	22C0	161WR					
PEPO1	-	17C0						
PH	-	19C0	87	88WR	180WR	182WR		
PHI	-	12C0						
PI	-	9C0	159					
PI02	-	9C0						
PMAX	-	18C0						
PMIN	-	18C0						
PO	-	25C0						
PON	-	19C0	48	127	128WR	180WR	182WR	
PRESS	-	10C0						
PRNT	-	13C0	108	109WR	148	149WR	180WR	182WR
* PRT7	-	1*						
R	-	10C0						
RADIAN	-	9C0						
RB	-	15C0						
RBZ	-	15C0	96	97WR	136	137WR		
RBZTO	-	15C0						
* RETURN	-	186*	192*					
SCUR	-	18C0						

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SII      - 6CO
SPHOT    - 20CO 90 91WR
SPONDY   - 20CO 130 131WR
SRMDTI   - 40= 41 42WR
SRMVTI   - 44= 45 46WR
SWDOTN   - 22CO 54 55WR
T         - 19CO
TAUA0    - 14CO
TAUT0    - 18CO
TAUWDP   - 15CO
TAUZ     - 15CO 99 100WR 139 140WR
TAUZT0   - 15CO
TCOMB    - 10CO
TERM     - 30= 31WR 34= 35WR 37= 38WR 41= 42WR 45= 46WR 51= 52WR 54=
          55WR 57= 58WR 60= 61WR 63= 64WR 66= 67WR 69= 70WR 72= 73WR
          77= 78WR 80= 81WR 87= 88WR 90= 91WR 93= 94WR 96= 97WR 99=
          100WR 102= 103WR 105= 106WR 108= 109WR 113= 114WR 116= 117WR 119= 120WR
          122= 123WR 127= 128WR 130= 131WR 133= 134WR 136= 137WR 139= 140WR 142=
          143WR 145= 146WR 148= 149WR 151= 152WR 156= 157WR 174= 175WR
IGHRAIN  - 26DA 190WR
TIME     - 19CO 27WR 180WR 182WR 184WR
TIMEW    - 13CO
TOFLAG   - 18CO
U        - 19CO
UT       - 13CO
VEH      - 20CO
VF       - 15CO 66 67WR
VFCYL    - 16CO 119 120WR
VFH      - 20CO 102 103WR
VFINT    - 20CO
VFN      - 20CO 142 143WR
VFWEB    - 22CO
VIS      - 20CO
VP       - 15CO 122 123WR
VPH      - 21CO 105 106WR
VPN      - 21CO 145 146WR
WD       - 22CO
WDQT     - 18CO 51 52WR 177 180WR 182WR
WDOT0    - 18CO
WDOT1    - 13CO
WF       - 23CO 69 70WR 178 180WR 182WR 184WR
WFI      - 24CO 178 189
WGTOT    - 22CO 72 73WR
WRD13    - 178= 180WR 182WR
WRD4     - 177= 180WR 182WR
XBH      - 14CO
XBN      - 14CO
ZCALC    - 13CO
THE VARIABLE= ZERODV -IS USED BEFORE IT IS DEFINED
ZERODV   - 177

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D256-10020-4

```
1  SUBROUTINE PRTR
2  IMPLICIT REAL (A-H,O-Z,M)
3  WRITE(6,B02)
4  B02 FORMAT(1H1,T15,'THESE ARE THE VALUES FROM THE RECONSTRUCTION MODUL
5  IE')
6  RETURN
7  END
```

INDEX

SUBROUTINE PRTB

PAGE 108

SYMBOL +-----+
REFERENCES +-----+

802 - 3WR 4#
* PRTB - 1#
* RETURN - 5#

+-----+


```

1      SUBROUTINE RECON
2      IMPLICIT REAL (A-H,O-Z,M)
3      COMMON/BLK002/ SILUP1(18),SILVAC(18),ALSTRT(18),APEXT(18)
4      COMMON/BLK004/ UTB,UTE,MC(30),AL,AK(15),CN(10),PCBT,ARETB,ARETE,
1      SINHL,SIBT,ETABT,GBT,WPB1,DPB,DPE,AMALFE,CLAME,DATE,#INE,WPE,
2      OK(10),PAMB1,PEXBT,PEXIT
5      COMMON/BLK005/ NLEWIS,NS1,NF,NRECON,NCASES,NDISP,NCASE
6      COMMON/BLK009/ M1T01,MPT07,S11,AMIRK(10),AMPKR(10),DEL1,MPP,M1Z
7      COMMON/BLK015/ AT,AFBAR,MF(N,MFINRT,MFINZ,MFOUTZ,MINST,MMOTI
8      COMMON/BLK016/ MFINT1,F1,M1F,M1FZ,M1R,F1Z,AT1IN,AT1VIN
9      COMMON/BLK017/ PBAR,PFLAG,PHEADZ,PHEP1,TIMEZ,TOL1,TOL3,MVER1,
10     > NOZPOS
11     COMMON/BLK020/ A,MFOU1,PNS
12     COMMON/BLK021/ TSREC,TEREC,CSHAR,PNSBAR,TWEB,P1TW,CSCDEF(3),LIST1,
13     > STAT1C
14     COMMON/BLK022/ ICOMP,IPASS
15     COMMON/BLK023/ DATA(10),NWRIS,NUNIT
16     COMMON/BLK024/ AF11,ADEL,ICOUNT
17     DOUBLE PRECISION HSUM,SSUM,CPR,OLVTP,OLVPI,GAMMAS
18     COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),OLVTP(13),OLVPI(13)
19     1 ,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SUNVEL(13),TIT(13)
20     2 ,VLM(13),TUTN(13)
21     COMMON/PTRF/PLP(22),VMOC(13),SPIM(13),YAC1(13),SUMAR(13),SUPAR(13)
22     1 ,APP(13),AEAT(13),CSTR,EQL,FROZ,SSU,ANFA,AWT
23     EQUIVALENCE (TIME,DATA(1)),(PHEAD,DATA(2))
24     LOGICAL LIS(1),STAT1C,ICOMP
25     IF(LIS1) GO TO 70
26     TIMEZ=0.0
27     PHEADZ=0.0
28     TEREC=0.0
29     TWEB=0.0
30     P1TW=0.0
31     PNSIN=0.0
32     PHIN1=0.0
33     10 CONTINUE
34     REWIND NUNIT
35     15 CONTINUE
36     READ(NUNIT) (DATA(I),I=1,NWRIS)
37     CALL BIAS
38     IF(TEREC.GT.0.0) GO TO 20
39     IF(PHEAD.GT.PFLAG) GO TO 25
40     IF(PHEADZ.GT.PFLAG) GO TO 30
41     PHEADZ=PHEAD
42     GO TO 15
43     20 IF(TIME.GE.TSREC) GO TO 40
44     GO TO 15
45     25 IF(PHEADZ.LE.PFLAG) GO TO 35
46     GO TO 40
47     30 TEREC=(TIME-TIMEZ)*((PFLAG-PHEADZ)/(PHEAD-PHEADZ)) + TIMEZ
48     TIME = TEREC
49     PHEAD = PFLAG
50     GO TO 40
51     35 TSREC=(TIME-TIMEZ)*((PFLAG-PHEADZ)/(PHEAD-PHEADZ)) + TIMEZ
52     TIMEZ = TSREC
53     PHEADZ = PFLAG

```

```

49      PMSZ = PHEADZ - PADJ(TIMEZ)
50      PNS = PHEAD - PADJ(TIME)
51      PHINT = (PHEAD+PHEADZ)*((TIME-TIMEZ)/2.0) + PHINT
52      PMSINT = (PNS+PMSZ)*((TIME-TIMEZ)/2.0) + PMSINT
53      IF (TIME.GT.TEREC) GO TO 50
54      IF (PITW.GT.0.0) GO TO 45
55      42 TIMEZ=TIME
56      PHEADZ = PHEAD
57      PMSZ = PNS
58      PHINTZ = PHINT
59      GO TO 15
60      45 IF (PHINT.LT.PITW) GO TO 42
61      TWB = (TIME-TIMEZ)*((PITW-PHINTZ)/(PHINT-PHINTZ)) + TIMEZ
62      GO TO 70
63      50 IF (TWB.GT.0.0) GO TO 70
64      PITW = PHINT*PHEPI/100.0
65      CSBAR = PMSINT*ATANH(1)/MPIOT
66      PBAR = PMSINT/(TEREC - TSREC)
67      IF (NLEWIS.EQ.0) GO TO 60
68      55 CONTINUE
69      CALL LEW11
70      SUPAK(1)=50.0
71      P(1)=300.0
72      P(2)=500.0
73      P(3)=700.0
74      P(4)=900.0
75      P(5)=1100.0
76      CALL LEW15
77      NLEWIS=0
78      NPIS=5
79      DO 58 I=1,NPIS
80      58 P(I)=P(1)*14.096
      C
      C      LEAST SQUARE FIT
      C
81      CALL LESSQ(P,ACSTRT,NPIS,CSCUEF)
82      IF (TWB.GT.0.0) GO TO 75
83      60 TIMEZ = TSREC
84      PHEADZ = PFLAG
85      PMSZ = PHEADZ - PADJ(TIMEZ)
86      GO TO 10
      C
      C      START MATCHING ROUTINE
      C
87      70 IF (NLEWIS.EQ.0) GO TO 75
88      GO TO 55
89      75 CSCUEF(1) = CSBAR-CSCUEF(2)*PBAR - CSCUEF(3)*PBAR**2
90      65 CONTINUE
91      CALL IBM
92      IF (IPASS.GT.0) GO TO 110
93      ILOOP=0
94      DELCS=CK(4)
95      CSIND=0.0
96      IPASS=1
97      110 ILOOP = ILOOP + 1

```

ORIGINAL PAGE IS
OF POOR QUALITY

* BLK020 -	10*							
* BLK021 -	11*							
* BLK022 -	12*							
* BLK023 -	13*							
* BLK024 -	14*							
CK -	400	65						
CLAME -	400							
CPK -	1500	1000						
CSBAR -	1100	65=	89					
CSCEP -	1100	81AG	89=	113=				
CSIND -	95=	111	11c=	113	117	118=		
CSIN -	1700							
DATA -	1300	18E0	31K0					
DELOS -	94=	111=	113	114=	117=			
DELI -	600							
DELVP -	1500	1600						
DELVP -	1500	1600						
DPB -	400							
DPI -	400							
DID -	400							
DIE -	400							
EOL -	1700							
EIA01 -	400							
FI -	800							
FIZ -	800							
FROZ -	1700							
GAMMA5 -	1500	1600						
HSDM -	1500	1600						
I -	31K0	7400	80					
* IOK -	91*							
ICOMP -	1200	19L0	103=	108=				
ICOUNT -	1400							
* IFIA -	110	116						
ILUOP -	93=	97=	100=	101WR	105=	106WR	110	116
IPASS -	1200	92	96=					
* LESS0 -	51*							
* LEWIS -	76*							
* LEW11 -	69*							
LIS11 -	1100	19L0	20					
LOC -	400							
MF1W -	700							
MF1W11 -	800							
MF1W11 -	700							
MF1W12 -	700							
MF003 -	1000							
MF0032 -	700							
MIF -	800							
MIF2 -	800							
MINS1 -	700							
MIR -	800							
MIT01 -	600							
MIZ -	600							
MMU01 -	700							
MPR -	600							
MPU01 -	600	65						

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I N D E X

SUBROUTINE RECON

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TIME2	-	900	21=	47	46	47=	49	51	52	55=	61	83=	85,
TUL1	-	900											
TUL3	-	900											
TUTN	-	1600											
TSREC	-	1100	30	40=	47	66	83						
TIT	-	1600											
TwLE	-	1100	24=	61=	63	82							
V	-	1600											
VAC1	-	1700											
VLI1	-	1600											
VMOL	-	1700											
WINE	-	400											
WM	-	1600											
WPD1	-	400											
WPE	-	400											

11/11/11 10:40:00 AM

```

1  SUBROUTINE SISCAL
2  C  ISP SCALING MODULE (HARRIS)
3  IMPLICIT REAL (A-H,O-Z,M)
4  LOGICAL LIST1,STATIC
5  COMMON/BLK002/ SILOPT(18),SILVAC(18),ACSTRT(18),APEXT(18)
6  COMMON/BLK004/ DTR,DTE,NC(30),AL,AK(15),CK(10),PCBT,ARETR,ARETF, BATES
7  1 SIBNL,SIBT,ETABT,QBT,WPBT,DPB,DPE,AHALFE,CLAME,QAIE,WINE,WPE, BATES
8  2 OK(10),PAMBT,PEXBT,PEXIT
9  COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE ALL
10 COMMON/BLK007/ SICON,PCT,ARET,PAMT,AHALF1,WD2,PCAVE CDSI
11 COMMON/BLK011/ ETACS,TSOL SISCAL
12 COMMON/BLK013/ CSTAR,SIAE,SIDE,WD1,ETANZ,CSTAR2,SIACON,ETANZ2, OUTPUT
13 5 CLAME2,SIBAT,SILDVH,SILOR,SIL2PB,SIAS,SILQVE,SILQE,SIL2PE OUTPUT
14 COMMON/BLK021/ TSREC,TEREC,CSBAR,PNSBAR,TWEB,PITW,CSCOE(3),LIST1,
15 3 STATIC
16 COMMON/BLK028/ ALPHA,QEX,XLAMBD,SILSB,CSTAR1
17 DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS 80
18 COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13) 190
19 1,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13) 200
20 2,VLM(13),TOTN(13) 210
21 COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VAC(13),SUBAR(13),SUPAR(13) 340
22 1,APP(13),AEAT(13),CSTR,EQL,FROZ,SSO,AREA,AWT 350
23 DIMENSION ACSSAV(18)
24 20 IF(NLEWIS.GT.0) GO TO 30
25 SIAE = AK(1) + AK(2)*ARET+AK(3)*ARET**2
26 CSTAR2=NC(7)
27 GO TO 50
28 30 CALL LEWIT
29 PT(1)=PCAVE
30 P(2)= 500.
31 P(3)= 700.
32 P(4)= 900.
33 SUPAR(1)=ARET
34 40 CALL LEWIS
35 SIAE = SILVAC(1)
36 CSTAR2=ACSTRT(1)
37 50 WD1 = PCAVE*CK(4)*DTE**2*CK(1)/(4.*CSTAR2*ETACS)
38 60 ETANZ = (AK(10)+AK(11)*ALOG(WD1)+AK(12)*(ALOG(WD1)**2.)
39 C INPUT DIVERGENCE LOSS CORRECTION END ITEM MOTOR
40 70 IF(CLAME.GT.0.0) GO TO 90
41 CLAME = 0.5 + 0.5*COS(AHALFE)
42 C APPROXIMATE CORRECTION END ITEM MOTOR
43 IF(ALPHA.GT.0.0 .AND. QEX.GT.0.0 .AND. XLAMBD.EQ.1.0)
44 5 CLAME= 0.5+0.5*COS((ALPHA+QEX)/2.0)
45 C METHOD OF CHARACTERISTICS CORRECTION END ITEM MOTOR
46 IF(ALPHA.GT.0.0 .AND. QEX.GT.0.0 .AND. XLAMBD.NF.1.0 )
47 5 CLAME= (0.5+0.5*COS(ALPHA))*XLAMBD
48 90 SIDE=CLAME*ETANZ*ETACS*SIAE*SILSB
49 CSTAR=CSTAR2*ETACS*OK(3)*SILSB
50 C
51 C FORCE THEORETICAL CSTAR CURVE FIT THROUGH END ITEM CALCULATED CSTAR
52 C
53 IF(NLEWIS.GT.0) GO TO 140
54 130 CSCOE(1)= CSTAR - CSCOE(2)*PCAVE - CSCOE(3)*(PCAVE**2)
55 39 CALL OUTPUT

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```
40      RETURN
41      DO 150 I=1,18
42          ICOUNT = I
43          IF(ACSTRT(I).NE.ACSTRT(I+1)) GO TO 160
44      150 CONTINUE
45      160 ICNT=0
46          IPC=1
47          DO 165 I=1,18
48              IF(P(I).NE.P(I+1)) GO TO 169
49              IF(P(I).NE.0.0) IPC=IPC+1
50      165 CONTINUE
51      168 ICOUNT = ICOUNT/IPC
52          DO 170 I=1,18,ICOUNT
53              ICNT = ICNT + 1
54      170 ACSSAV(ICNT) = ACSTRT(I)
55          DO 180 I=1,18
56              ICNT=1
57              P(I)=P(I)*14.696
58              IF(P(I).GT.0.0) GO TO 180
59              GO TO 190
60      180 CONTINUE
61      190 ICNT = ICNT - 1
62          CALL LESS0(P,ACSSAV,ICNT,CSCDEF)
63          GO TO 130
64      END
```


	DPH	-	500																
	DPE	-	500																
	DTB	-	500																
	DTE	-	500	29															
	EOL	-	1400																
	ETAHT	-	500																
	ETACS	-	800	29	35	36													
	ETANZ	-	900	30=	35														
	ETANZ2	-	900																
	FROZ	-	1400																
	GAMMAS	-	1208	1300															
	HSUM	-	1208	1300															
	I	-	4100	42	43	4700	48	49	5200	54	5500	56	57	58					
	ICNT	-	45=	53=	54	56=	61=	62AG											
	ICOUNT	-	42=	51=	5200														
	IPC	-	46=	49=	51														
*	LESSD	-	42*																
*	LEWIS	-	26*																
*	LEWIT	-	20*																
	LIST1	-	3LG	1000															
	MC	-	500	18															
	NCASE	-	600																
	NCASES	-	600																
	NOISP	-	600																
	NF	-	600																
	NLEWIS	-	600	16	37														
	NRECON	-	600																
	NSI	-	600																
	OK	-	500	36															
*	OUTPUT	-	39*																
	P	-	1300	21=	22=	23=	24=	48	49	57=	58	62AG							
	PAMRT	-	500																
	PAMT	-	700																
	PCAVE	-	700	21	29	38													
	PCBT	-	500																
	PCP	-	1400																
	PCT	-	700																
*	PERF	-	14*																
	PEXRT	-	500																
	PEXIT	-	500																
	PITW	-	1000																
	PNSBAR	-	1000																
*	POINIS	-	13*																
	PPP	-	1300																
	QAIF	-	500																
	QHT	-	500																
	QFX	-	1100	33	34														
*	RETURN	-	40*																
	SIACON	-	900																
	SIAE	-	900	17=	27=	35													
	SIAS	-	900																
	SIBAT	-	900																
	SIBNL	-	500																
	SIHT	-	500																
	SICON	-	700																

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I N D E X

SUBROUTINE SISCAL

PAGE 120

SIDE	-	9C0	35=		
SILDVB	-	9C0			
SILDVE	-	9C0			
SILOPT	-	4C0			
SILQH	-	9C0			
SILQE	-	9C0			
SILSB	-	11C0	35	36	
SILVAC	-	4C0	27		
SILZPR	-	9C0			
SILZPE	-	9C0			
* SISCAL	-	1*			
SONVEL	-	13C0			
SPIM	-	14C0			
SSUM	-	12DB	13C0		
SS0	-	14C0			
STATIC	-	3L6	10C0		
SUBAR	-	14C0			
SUPAR	-	14C0	25=		
T	-	13C0			
TEREC	-	10C0			
TOTN	-	13C0			
TSOL	-	8C0			
TSRFC	-	10C0			
T?T	-	13C0			
TWER	-	10C0			
V	-	13C0			
VACI	-	14C0			
VLM	-	13C0			
VMOC	-	14C0			
WD1	-	9C0	29=	30	
WD2	-	7C0			
WINE	-	5C0			
WM	-	13C0			
WPBT	-	5C0			
WPE	-	5C0			
XLAMBD	-	11C0	33	34	

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2256-10720-4

```
1      SUBROUTINE VARI(A,AJSIG,ATAB,NPTS)
2      DIMENSION ATAB(1)
3      SUMX=0.0
4      DO 10 I=1,NPTS
5          SUMX = SUMX + ATAB(I)
6      10 CONTINUE
7      XHAR = SUMX/FLOAT(NPTS)
8      SUMX=0.0
9      DO 20 I=1,NPTS
10         SUMX = SUMX + (ATAB(I)-XHAR)**2
11     20 CONTINUE
12     AJSIG = 3.*SQRT(SUMX/(FLOAT(NPTS-2)))/A
13     RETURN
14     END
```

SYMBOL		REFERENCES									
10	~	400,	6*								
20	-	900	11*								
A	-	1AG	12								
ATAB	-	1AG	201	5	10						
A3SIG	-	1AG	12=								
* FLOAT	-	7	12								
I	-	400	5	900	10						
NPTS	-	1AG	400	7	900	12					
* RETURN	-	13*									
* SQRT	-	12									
SUMX	-	3=	5=	7	8=	10=	12				
* VARI	-	1*									
XBAR	-	7=	10								

1	C	SUBROUTINE LEWIS	20
2		REAL*8 LEW//LEWIS DA//	
3		DOUBLE PRECISION G,X	30
	C		40
	C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	50
	C	IBM 360 MACHINES ONLY	60
	C		70
4		DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS	80
5		DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN	90
	C		100
6		REAL MIX(15)	110
7		INTEGER DATA, OMIT, INSERT, REAC, BLANK, THRM, FND, SUB	120
8		LOGICAL SHOCK,MMHG,UV,IC,DETN,SIUNIT,EUNIT,NSQM,CALCH	130
9		LOGICAL HP,SP,TP,NEW,IONS,MOLES,FROZ,EQL,PSIA,RKT,VOL,TV,SV	140
10		LOGICAL FA,OF,FRATIO,FPCT,OTTO,ERR	150
	C		160
11		DIMENSION OMIT(3,3),NCD(4),FINSERT(3,3),RHO(26),LVP(2),VM(2),VL(26)	170
		1,DAT(22)	180
12		COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13)	190
		1,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TFT(13)	200
		2,VLM(13),TOTN(13)	210
13		COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	220
		1,DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)	230
14		COMMON/MISC/ENN,SUMN,TT,SO,ATOM(3,101),LLMT(15),R0(15),R0P(15,2)	240
		1,TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUBO,AC(2),AM(2)	250
		2,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	260
		3,ANUM(15,5),PECW(15),ENTH(15),FAZ(15),RIEMP(15),FOX(15),DENS(15)	270
		4,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE	280
15		COMMON/DOUBLE/ G(20,21), X(20)	290
16		COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	300
		1,NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEW,NSUB,NSUP,ITM,CPCVFR,CPCVFO	310
		2,IONS,NC,INSERT,JSOL,JLIG,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	320
		3,IQSAVE,LSAVE,ISUP,ISUB,ITNUM	330
17		COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VACI(13),SUBAR(13),SUPAR(13)	340
		1,APP(13),AEAT(13),CSTR,EQL,FROZ,SSO,AREA,AWT	350
18		COMMON/BLK001/IRKT01,IRKT02,ERR,IN	
	C		360
19		EQUIVALENCE (OMIT,ENLN),(INSERT,DELN),(OXF,MIX)	370
		1,(OF,OXFL),(RHO,P,VL),(SO,SO),(OTTO,CPCVFR),(DATA,DAT)	380
	C		390
20		DATA MIT/4HOMIT/,BLANK/1H /, REAC/4HREAC/,I7/7H00/	40
		1,NMLT/4HNAME/,IE/1HE/,INSERT/4HINSE/, FND/3HFND/	410
		2,GAS/1HG/,LAST/4HLAST/	420
	C		470
21		NEW = .FALSE.	480
22		ERR = .FALSE.	
	C		490
23		CALL DATLOC(LEW)	
24		IF(ERR) RETURN	
25		RR = 8314.3	520
26		R = RR/4184.	530
27		203 READ (IN,204) (DATA(I),I=1,15)	
28		204 FORMAT(5(3A4,3X))	550
29		IF(DATA(1),EQ,REAC) GO TO 11	590

30	IF (DATA(I).EQ.MIT) GO TO 205	600
31	IF (DATA(I).EQ.INSERT) GO TO 180	610
32	IF (DATA(I).EQ.END) GO TO 210	620
33	IF (DATA(I).EQ.BLANK) GO TO 203	630
34	1023 WRITE(6,1024)	640
35	1024 FORMAT('0ERROR IN LEWIS INPUT CARD, CONTENTS BELOW')	
36	WRITE (6,2045) (DATA(I),I=1,15)	560
37	2045 FORMAT(1X,5(3A4,3X))	570
38	GO TO 203	660
39	11 NSERT = 0	670
40	MOLES = .FALSE.	680
41	CALL REACT	690
42	IF (NLM.EQ.0) WRITE(6,52)	700
43	52 FORMAT(24H0ERROR IN REACTANT CARDS)	710
44	CALCH = .FALSE.	720
45	DO 755 N=1,NREAC	730
46	IF (NAME(N,5).EQ.IZ) CALCH=.TRUE.	740
47	755 CONTINUE	750
48	GO TO 203	760
	C	1030
	C CHECK INSERT CARDS	1040
	C	1050
49	180 DO 185 I=4,15,3	1060
50	IF (DATA(I).EQ.BLANK) GO TO 185	1070
51	NSERT = NSERT+1	1080
	C IF (NSERT.GT.50) WRITE(6,)	
52	IF (NSERT.GT.50) GO TO 203	
53	INSERT(1,NSERT) = DATA(I)	1090
54	INSERT(2,NSERT) = DATA(I+1)	1100
55	INSERT(3,NSERT) = DATA(I+2)	1110
56	185 CONTINUE	1120
57	GO TO 203	1130
	C	1140
	C CHECK OMIT CARDS	1150
	C	1160
58	205 DO 208 I=4,15,3	1170
59	IF (DATA(I).EQ.BLANK) GO TO 208	1180
60	NOMIT = NOMIT+1	1190
	C IF (NOMIT.GT.50) WRITE(6,)	
61	IF (NOMIT.GT.50) GO TO 209	
62	OMIT(1,NOMIT) = DATA(I)	1200
63	OMIT(2,NOMIT) = DATA(I+1)	1210
64	OMIT(3,NOMIT) = DATA(I+2)	1220
65	208 CONTINUE	1230
66	209 NEWR= .TRUE.	
67	REWIND 4	1250
68	GO TO 203	1260
	C	1270
	C BEGIN NAMELIST INPT2	1280
	C	1290
69	210 DO 300 I=1,26	1300
70	I(I) = 0.	1320
71	V(I) = 0.	1330
72	300 CONTINUE	1340
73	TRACE = 0.	1350

74	SQ = 0.	1360
75	V1 = 0.	1370
76	V2 = 0.	1380
77	CR = 0.	1390
78	RHOP = 0.	1400
79	KASE = 0	1410
80	TP = .FALSE.	1420
81	HP = .FALSE.	1430
82	SP = .FALSE.	1440
83	TV = .FALSE.	1450
84	UV = .FALSE.	1460
85	SV = .FALSE.	1470
86	OTTO = .FALSE.	1480
87	RKT = .TRUE.	
88	SHOCK = .FALSE.	1500
89	VOL = .FALSE.	1520
90	SIUNIT = .FALSE.	1560
91	EUNITS = .FALSE.	1570
92	IONS = .FALSE.	1580
93	FA = .FALSE.	1600
94	OF = .FALSE.	1610
95	ERATIO = .FALSE.	1620
96	FPCT = .FALSE.	1630
97	DO 303 I=1,15	1640
98	MIX(I) = 0.	1650
99	303 CONTINUE	1660
100	NT = 1	1670
101	EOL = .TRUE.	1680
102	304 DO 305 I=1,26	1920
103	IF (P(I).EQ.0.) GO TO 322	1930
104	NP = I	1940
105	P(NP)=P(NP)/14.696006	1960
106	305 CONTINUE	1980
107	322 DO 307 IT = 1,26	1990
108	IF (T(IT).EQ.0.) GO TO 722	2000
109	NT = IT	2010
110	307 CONTINUE	2020
111	722 DO 625 IST=1,15	2030
112	IF (WP(1).EQ.0.) OXF(IST)=0.	2040
113	IF (MIX (IST).NE.0.) GO TO 323	2050
114	IF (IST.NE.1) GO TO 745	2060
115	IF (WP(2).NE.0.) OXFL = WP(1)/WP(2)	2090
116	GO TO 333	2100
117	323 OXFL = MIX(IST)	2110
118	IF (FA) OXFL = 1./ MIX(IST)	2120
119	IF (FPCT) OXFL = (100.- MIX(IST))/ MIX(IST)	2130
120	IF (.NOT.ERATIO) GO TO 333	2140
121	EQRAT = MIX(IST)	2150
122	IF (EQRAT.EQ.1.) EQRAT = 1.000005	2160
123	OXFL = (-EQRAT*VMIN(2)-VPLS(2))/(VPLS(1)+EQRAT*VMIN(1))	2170
124	333 OXF(IST) = OXFL	2180
125	NOF = IST	2190
126	625 CONTINUE	2200
127	745 IF (.NOT.IONS) GO TO 746	2210
128	IF (LLMT(NLM).EQ.1) GO TO 748	2220

129	NLM = NLM+1	2230
130	LLMT(NLM) = IE	2240
131	80P(NLM,1) = 0.	2250
132	80P(NLM,2) = 0.	2260
133	GO TO 747	2270
134	746 IF (LLMT(NLM).EQ.IE) NLM=NLM-1	2280
135	NLM1 = NLM+1	2290
136	IF (LLMT(NLM1).NE.IE) GO TO 748	2300
137	LLMT(NLM1) = 0	2310
138	747 NEWR = .TRUE.	2320
139	REWIND 4	2330
140	748 IF (NEWR) CALL SEARCH	2340
141	IF (NS.EQ.0) GO TO 900	
C		2360
C	INITIAL ESTIMATES	2370
C		2380
142	S0 = S0/R	2390
143	ENN = .1	2400
144	ENNL = -2.3025851	2410
145	SUMN = ENN	2420
146	XI = NS - NC	2430
147	XI = ENN/XI	2440
148	XLN = ALOG(XI)	2450
149	DO 432 J=1,NS	2460
150	IF (IUSE(J).GT.0) IUSE(J)=-IUSE(J)	2470
151	EN(J,1) = 0.	2480
152	ENLN(J) = 0.	2490
153	IF (IUSE(J).NE.0) GO TO 432	2500
154	EN(J,1) = XI	2510
155	ENLN(J) = XLN	2520
156	432 CONTINUE	2530
157	IQ1 = NLM+1	2540
158	IF (NC.EQ.0.OR.NSERT.EQ.0) GO TO 790	2550
159	DO 302 I=1,NSERT	2560
160	INC = 0	2570
161	DO 301 J=1,NS	2580
162	IF (IUSE(J).EQ.0) GO TO 301	2590
163	INC = INC+1	2600
164	IF (SUB(J,1).NE.ENSERT(1,1)) GO TO 301	2610
165	IF (SUB(J,2).NE.ENSERT(2,1)) GO TO 301	2620
166	IF (SUB(J,3).NE.ENSERT(3,1)) GO TO 301	2630
167	IF (T(1).EQ.0.) GO TO 295	2640
168	IF (T(1).LT.TEMP(INC,1).OR.T(1).GT.TEMP(INC,2)) GO TO 301	2650
169	295 IQ1 = IQ1+1	2660
170	IUSE(J) = -IUSE(J)	2670
171	GO TO 302	2680
172	301 CONTINUE	2690
173	302 CONTINUE	2700
174	790 CONTINUE	2710
175	IF (RKT) CALL ROCKET	2770
176	800 NSERT = 0	2790
177	RETURN	
178	900 ERR = .TRUE.	
179	RETURN	
180	END	2810

SYMBOL	-----	REFERENCES	-----
11	- 29	39*	
52	- 42WR	43*	
180	- 31	49*	
185	- 4900	50	56*
203	- 27*	33	38 48 52 57 68
204	- 27RD	28*	
205	- 30	58*	
208	- 5800	59	65*
209	- 61	66*	
210	- 32	69*	
295	- 167	169*	
300	- 6900	72*	
301	- 16100	162	164 165 166 168 172*
302	- 15900	171	173*
303	- 9700	99*	
304	- 102*		
305	- 10200	106*	
307	- 10700	110*	
322	- 103	107*	
323	- 113	117*	
333	- 116	120	124*
432	- 14900	153	156*
625	- 11100	126*	
722	- 108	111*	
745	- 114	127*	
746	- 127	134*	
747	- 133	138*	
748	- 128	135	140*
755	- 4500	47*	
790	- 158	174*	
800	- 176*		
900	- 141	178*	
1023	- 34*		
1024	- 34WR	35*	
2045	- 36WR	37*	
A	- 13CO		
AC	- 14CO		
AEAT	- 17CO		
* ALOG	- 148		
AM	- 14CO		
ANUM	- 14CO		
APP	- 17CO		
AREA	- 17CO		
ATOM	- 14CO		
AWI	- 17CO		
BLANK	- 7IN	200A	33 50 59
* BLK001	- 18*		
B0	- 14CO		
B0P	- 14CO	131=	132=
CALCH	- 8LG	16C0	44= 46=
COEF	- 5DB	13C0	
CONVG	- 16C0		
CPCVEQ	- 16C0		

I N D E X

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IRKT01	1800													
IRKT02	1800													
IST	11100	112	113	114	117	118	119	121	124	125				
ISUR	1600													
ISUP	1600													
ISV	1600													
IT	1600	10700	108	109										
ITM	1600													
ITNUM	1600													
IUSE	1300	150	153	162	170=									
IZ	200A	46												
J	14900	150	151	152	153	154	155	16100	162	164	165	166	170	
JL10	1600													
JS01	1600													
JS1	1600													
KASE	1600	79=												
KHAT	1600													
LAST	200A													
LEW	2RL	23AG												
LEWIS	1*													
LLMT	1400	128	130=	134	136	137=								
LSAVE	1600													
LVP	110I													
MISC	14*													
MIT	200A	30												
MIX	6RL	19EQ	98=	113	117	118	119	121						
MMHG	8LG													
MOLFS	9LG	1600	40=											
N	4500	46												
NAME	1400	46												
NC	1600	146	158											
NCD	110I													
NEWPR	9LG	1600	21=	66=	138=	140								
NFZ	1600													
NLM	1600	42	128	129=	130	131	132	134	135	157				
NLM1	135=	136	137											
NMLT	200A													
NOF	1600	125=												
NOMIT	1600	60=	61	62	63	64								
NP	1600	104=	105											
NPP	1600													
NPT	1600													
NREAC	1600	4500												
NS	1600	141	146	14900	16100									
NSERT	1600	39=	51=	52	53	54	55	158	15900	176=				
NSQM	8LG													
NSUH	1600													
NSUP	1600													
NT	1600	100=	109=											
OF	10LG	1400	19EQ	94=										
OMIT	71N	110I	19EQ	62=	63=	64=								
OTT0	10LG	19EQ	86=											
OXF	1400	19EQ	112=	124=										
OXFL	19EQ	115=	117=	118=	119=	123=	124							
P	1200	19EQ	103	105=										

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PCP	-	17C0			
PECWT	-	14C0			
* PERF	-	17*			
* POINTS	-	12*			
PP	-	14C0			
PPP	-	12C0			
PSIA	-	9LG			
R	-	14C0	26=	142	
REAC	-	7IN	20DA	29	
* REACT	-	41*			
* RETURN	-	24*	177*	179*	
RH	-	14C0			
RHO	-	11DI	19EQ		
RHOP	-	14C0	78=		
RKT	-	9LG	87=	175	
RMW	-	14C0			
* ROCKET	-	175*			
RR	-	14C0	25=	26	
RTEMP	-	14C0			
S	-	5DB	13C0		
* SEARCH	-	140*			
SHOCK	-	8LG	16C0	88=	
SIUNIT	-	8LG	90=		
SIZE	-	14C0			
SLN	-	13C0			
SO	-	19EQ			
SONVEL	-	12C0			
SP	-	9LG	16C0	82=	
* SPÉCES	-	13*			
SPIM	-	17C0			
SSUM	-	4DB	12C0		
SSO	-	17C0			
SUB	-	7IN	13C0	164	165 166
SUBAR	-	17C0			
SUMN	-	14C0	145=		
SUPAR	-	17C0			
SV	-	9LG	85=		
SO	-	14C0	19EQ	74=	142=
T	-	12C0	70=	108	167 168
TEMP	-	13C0	168		
THIGH	-	14C0			
THRM	-	7IN			
TLN	-	14C0			
TLOW	-	14C0			
TM	-	14C0			
TMID	-	14C0			
TOTN	-	12C0			
TP	-	9LG	16C0	80=	
TRACE	-	14C0	73=		
TT	-	14C0			
TTT	-	12C0			
TV	-	9LG	83=		
UV	-	8LG	84=		
V	-	12C0	71=		
VACI	-	17C0			

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VL	-	1101	19E0	
VLM	-	12C0		
VM	-	1101		
VMIN	-	14C0	123	
VMOC	-	17C0		
VOL	-	9L6	16C0	89=
VPLS	-	14C0	123	
V1	-	75=		
V2	-	76=		
WM	-	12C0		
WP	-	14C0	112	115
X	-	30H	15C0	
XI	-	146=	147=	148 154
XLN	-	148=	155	

1		SUBROUTINE REACT	2820
2	C	LOGICAL HP,SP,TP,ERR, CONV,NEW,IONS,MOLES,EQL,FROZ,VOL	2830
3	C	DIMENSION ANAME(15,5),V(15),LLMTS(15),SBOP(15,2)	2840
4	C	COMMON/BLK001/IRKT01,IRKT02,ERR,IN	2850
5		COMMON/MISC/ENN,SUMN,IT,S0,ATOM(3,101),LLMT(15),B0(15),BOP(15,2)	2860
		1 ,YM,TLOW,TMID,THIGH,PP,CPSUM,OF,EORAT,FPCT,R,RR,HSUB0,AC(2),AM(2)	2870
		2 ,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	2880
		3 ,ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTEMP(15),FOX(15),DENS(15)	2890
		4 ,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE	2900
6		COMMON/INDX/ CONV,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	2910
		1 ,NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEW,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	300
		2 ,IONS,NC,NSERT,JSOL,JLIQ,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	2940
		3 ,ISAVE,LSAVE,ISUP,ISUB,ITNUM	2950
7	C	EQUIVALENCE (NAME,ANAME),(NLM,L),(BLANK,LANK)	2960
8	C	DATA MOL/1HM/7,OX/1H0/;LANK/1H/7,IZERO/2H00/;NLS/07,ZERO/1H0/	2970
9	C	DO 10 K=1,2	2980
10		WP(K)=0.	2990
11		HPP(K)=0.	3000
12		RH(K)=0.	3010
13		VPLS(K)=0.	3020
14		VMIN(K)=0.	3030
15		AM(K)=0.	3040
16		DO 8 J=1,15	3050
17		LLMT(J)=0	3060
18		BOP(J,K)=0.	3070
19	8	CONTINUE	3080
20	10	CONTINUE	3090
21		NFUEL = 0	3100
22		N=1	3110
23		L=1	3120
	C	READ AND WRITE REACTANT CARDS	3130
24	C	20 READ(IN,21) (NAME(N,1),ANUM(N,1),I=1,5),PECWT(N),MOLE,ENTH(N),FAZ(N	3140
		1),RTEMP(N),FOX(N),DENS(N)	3150
25		21 FORMAT(5(A2,F7.5),F7.5,A1,F9.5,A1,F8.5,A1,F8.5)	3160
26		IF (NAME(N,1).EQ.LANK) GO TO 200	3170
27		IF (L.EQ.0) GO TO 20	3180
28		35 IF (MOLE.EQ.MOL) MOLES=.TRUE.	3190
	C	IF OXIDANT, K=1	3200
	C	IF FUEL, K=2	3210
	C		3220
29		IF (FOX(N).EQ.ZERO) FOX(N)=0X	3230
30		K = 1	3240
31		IF (FOX(N).EQ.OX) GO TO 37	3250
32		K = 2	3260
33		NFUEL = NFUEL+1	3270
34	37	DO 38 J=1,15	3280
			3290


```

35      DATA(J) = 0.          3400
36      38 CONTINUE          3410
37      RM=0.                3420
                                3430
C                                3440
C      STORE ATOMIC SYMBOLS IN LLMT ARRAY.  3450
C      CALCULATE MOLECULAR WEIGHT.  3460
C      TEMPORARILY STORE ATOMIC VALENCE IN V.  3470
C                                3480
38      DO 100 JJ=1,5        3490
39      IF (ANUM(N,JJ).EQ.0.) GO TO 101  3500
40      IF (ANAME(N,JJ).EQ.0) ANAME(N,JJ)=0X  3510
41      DO 41 J=1,15        3520
42      NJ = J              3530
43      IF (LLMT(J).EQ.0) GO TO 45      3540
44      IF (NAME(N,JJ).EQ.LLMT(J)) GO TO 46  3550
45      41 CONTINUE          3560
46      L = NJ              3570
47      LLMT(J)=NAME(N,JJ)  3580
48      DO 48 KK=1,101      3590
49      IF (ATOM(1,KK).EQ.ANAME(N,JJ)) GO TO 50  3600
50      48 CONTINUE          3610
51      L=0                 3620
52      GO TO 20            3630
53      50 RM=RM+ANUM(N,JJ)*ATOM(2,KK)  3640
54      V(J)=ATOM(3,KK)     3650
55      DATA(J)=ANUM(N,JJ)  3660
56      100 CONTINUE        3670
                                3680
C                                3690
C      ADD CONTRIBUTIONS TO WP(K), HPP(K), AM(K), BOP(J,K) AND RH(K)  3700
C                                3710
57      101 PCWT=PCWT(N)    3720
58      IF (MOLES) PCWT=PCWT*RM  3730
59      WP(K)=WP(K) + PCWT  3740
60      EM = ENTH(N)        3750
61      IF (NAME(N,5).NE.1ZERO) HPP(K)=HPP(K)+EM *PCWT/(RM*R)  3760
62      AM(K)=AM(K)+PCWT/RM  3770
63      DO 110 J=1,L        3780
64      BOP(J,K)=DATA(J)*PCWT/RM +BOP(J,K)  3790
65      110 CONTINUE        3800
66      IF (DENS(N).NE.0.) GO TO 115  3810
67      GO TO 117            3820
68      115 RH(K)=RH(K)+PCWT/DENS(N)  3830
69      117 RMW(N) = RM      3840
70      N = N+1             3850
71      IF (N.NE.16) GO TO 20  3860
72      200 NREAC =N-1       3870
73      IF (NFUFL.GT.0) GO TO 210  3880
                                3890
C                                3900
C      100 PERCENT OXIDANT, CALL REACTANTS FUEL  3910
C                                3920
74      DO 205 N=1,NREAC    3930
75      FOX(N) = BLANK      3940
76      205 CONTINUE
77      RH(2) = RH(1)
78      RH(1) = 0.

```

79	WP(2) = WP(1)	3950
80	WP(1) = 0.	3960
81	HPP(2) = HPP(1)	3970
82	AM(2) = AM(1)	3980
83	AM(1) = 0.	3990
84	DO 208 J=1,L	4000
85	BOP(J,2) = BOP(J,1)	4010
86	208 CONTINUE	4020
87	210 IF(L.EQ.0) GO TO 1000	4030
	C	4040
	C NORMALIZE HPP(K),AM(K),BOP(I,K), AND PECWT(N).	4050
	C CALCULATE RH(K), V+(K), AND V-(K)	4060
	C	4070
88	DO 220 K=1,2	4080
89	IF(WP(K).EQ.0.)GO TO 220	4090
90	HPP(K)=HPP(K)/WP(K)	4100
91	AM(K) = WP(K)/AM(K)	4110
92	IF(RH(K).NE.0.)RH(K)=WP(K)/RH(K)	4120
93	DO 215 J=1,L	4130
94	BOP(J,K)=BOP(J,K)/WP(K)	4140
95	IF(V(J).LT.0.)VMIN(K)=VMIN(K)+BOP(J,K)*V(J)	4150
96	IF(V(J).GT.0.)VPLS(K)=VPLS(K)+BOP(J,K)*V(J)	4160
97	215 CONTINUE	4170
98	IF(MOLES) GO TO 220	4180
99	DO 218 N=1,NREAC	4190
100	IF(FOX(N).EQ.0X.AND.K.EQ.2) GO TO 218	4200
101	IF(FOX(N).NE.0X.AND.K.EQ.1) GO TO 218	4210
102	PECWT(N) = PECWT(N)/WP(K)	4220
103	218 CONTINUE	4230
104	220 CONTINUE	4240
105	NEWNR=.TRUE.	4250
	C	4260
	C ARE ELEMENTS SAME AS FOR LAST SET OF REACTANTS, IF SO, NEWNR=.FALSE.	4270
	C	4280
106	IF(NLM.NE.NLS) GO TO 226	4290
107	IF(NOMIT.NE.0) GO TO 226	4300
108	DO 224 I=1,NLS	4310
109	DO 222 J=1,NLM	4320
110	IF(LLMT(J).NE.LLMTS(I)) GO TO 222	4330
111	SBOP(I,1) = BOP(J,1)	4340
112	SBOP(I,2) = BOP(J,2)	4350
113	GO TO 224	4360
114	222 CONTINUE	4370
115	GO TO 226	4380
116	224 CONTINUE	4390
117	NEWNR = .FALSE.	4400
118	DO 225 I=1,NLM	4410
119	LLMT(I) = LLMTS(I)	4420
120	BOP(I,1) = SBOP(I,1)	4430
121	BOP(I,2) = SBOP(I,2)	4440
122	225 CONTINUE	4450
123	GO TO 229	4460
	C	4470
	C	4480
124	226 NLS = NLM	4490

125	NOMIT = 0	4500
126	REWIND 4	4510
127	DO 228 I=1,NLM	4520
128	LLMTS(I) = LLMT(I)	4530
129	228 CONTINUE	4540
130	DO 230 N=1,NREAC	4550
131	IF (DENS(N),NE,0.) GO TO 230	4560
132	RH(2) = 0.	4570
133	RH (1) = 0.	4580
134	GO TO 1000	4590
135	230 CONTINUE	4600
136	1000 RETURN	4610
137	END	4620

SYMBOL	REFERENCES
8	16D0 19*
10	9D0 20*
20	24* 27 52 71
21	24RD 25*
35	28*
37	31 34*
38	34D0 36*
41	41D0 45*
45	43 46*
46	44 48*
48	48D0 50*
50	49 53*
100	38D0 56*
101	39 57*
110	63D0 65*
115	66 68*
117	67 69*
200	26 72*
205	74D0 76*
208	84D0 86*
210	73 87*
215	93D0 97*
218	99D0 100 101 103*
220	88D0 89 98 104*
222	109D0 110 114*
224	108D0 113 116*
225	118D0 122*
226	106 107 115 124*
228	127D0 129*
229	123 130*
230	130D0 131 135*
1000	87 134 136*
AC	5C0
AM	5C0 15= 62= 82= 83= 91=
ANAME	3DI 7EQ 40 49
ANUM	5C0 24RD 39 53 55
ATOM	5C0 49 53 54
BLANK	7EQ 75
BLK001	4*
B0	5C0
BOP	5C0 18= 64= 85= 94= 95 96 111 112 120= 121=
CALCH	6C0
CONVG	2LG 6C0
CPCVEQ	6C0
CPCVFR	6C0
CPSUM	5C0
CR	5C0
DATA	5C0 35= 55= 64
DENS	5C0 24RD 66 68 131
EM	60= 61
ENLSAV	5C0
ENN	5C0
ENNI	5C0

ENSAVF	-	500												
ENTH	-	500	24RD	60										
EQL	-	2LG												
EQHAT	-	500												
ERR	-	2LG	400											
FAZ	-	500	24RD											
FOX	-	500	24RD	29	31	75=	100	101						
FPCT	-	500												
FROZ	-	2LG												
HP	-	2LG	600											
HPP	-	500	11=	61=	81=	90=								
HSUH0	-	500												
I	-	24RD	108RD	110	111	112	118RD	119	120	121	127RD	128		
IC	-	600												
IMAT	-	600												
IN	-	400	24RD											
INDX	-	6*												
IONS	-	2LG	600											
IP	-	600												
IQSAVE	-	600												
IOI	-	600												
IRKT01	-	400												
IRKT02	-	400												
ISUR	-	600												
ISUP	-	600												
ISV	-	600												
IT	-	600												
ITM	-	600												
ITNUM	-	600												
IZERO	-	8DA	61											
J	-	1600	17	18	3400	35	4100	42	43	44	47	54	55	6300
	-	64	8400	85	9300	94	95	96	10900	110	111	112		
JJ	-	3800	39	40	44	47	49	53	55					
JL10	-	600												
JSOL	-	600												
JSI	-	600												
K	-	900	10	11	12	13	14	15	18	30=	32=	59	61	62
	-	64	68	8800	89	90	91	92	94	95	96	100	101	102
KASF	-	600												
KK	-	4800	49	53	54									
KMAT	-	600												
L	-	7FQ	23=	27	46=	51=	6300	8400	87	9300				
LANK	-	7FQ	8DA	26										
LLMT	-	500	17=	43	44	47=	110	119=	128					
LLMTS	-	301	110	119	128=									
LSAVE	-	600												
MISC	-	5*												
MOL	-	8DA	28											
MOLE	-	24RD	28											
MOLES	-	2LG	600	28=	58	98								
N	-	22=	24RD	26	29	31	39	40	44	47	49	53	55	57
	-	60	61	66	68	69	70=	71	72	7400	75	9900	100	101
	-	102	13000	131										
NAMF	-	500	7FQ	24RD	26	44	47	61						
NC	-	600												

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I N D E X

SUBROUTINE REACT

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NEWP	-	2LG	6C0	105=	117=								
NFUEL	-	21=	33=	73									
NFZ	-	6C0											
NJ	-	42=	46										
NLM	-	6C0	7EQ	106	109D0	118D0	124	127D0					
NLS	-	8DA	106	108D0	124=								
NOF	-	6C0											
NOMIT	-	6C0	107	125=									
NP	-	6C0											
NPP	-	6C0											
NPT	-	6C0											
NREAC	-	6C0	72=	74D0	99D0	130D0							
NS	-	6C0											
NSERT	-	6C0											
NSUB	-	6C0											
NSUP	-	6C0											
NT	-	6C0											
OF	-	5C0											
OX	-	8DA	29	31	40	100	101						
OXF	-	5C0											
PCWT	-	57=	58=	59	61	62	64	68					
PECWT	-	5C0	24RD	57	102=								
PP	-	5C0											
R	-	5C0	61										
* REACT	-	1*											
* RETURN	-	136*											
RH	-	5C0	12=	68=	77=	78=	92	132=	133=				
RHOP	-	5C0											
RM	-	37=	53=	58	61	62	64	69					
RMW	-	5C0	69=										
RR	-	5C0											
RTEMP	-	5C0	24RD										
SBOP	-	3DI	111=	112=	120	121							
SHOCK	-	6C0											
SIZE	-	5C0											
SP	-	2LG	6C0										
SUMN	-	5C0											
SQ	-	5C0											
THIGH	-	5C0											
TLN	-	5C0											
TLOW	-	5C0											
TM	-	5C0											
TMID	-	5C0											
TP	-	2LG	6C0										
TRACE	-	5C0											
TT	-	5C0											
V	-	3DI	54=	95	96								
VMIN	-	5C0	14=	95=									
VOL	-	2LG	6C0										
VPLS	-	5C0	13=	96=									
WP	-	5C0	10=	59=	79=	80=	89	90	91	92	94	102	
ZERO	-	8DA	29	40									

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1		SUBROUTINE SEARCH	4630
	C		4640
	C	SEARCH TAPE FOR THERMO DATA FOR SPECIES TO BE CONSIDERED	4650
	C		4660
	C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	4670
	C	IBM 360 MACHINES ONLY	4680
	C		4690
2		DOUBLE PRECISION COEFF,S,EN,ENLN,H0,DELN	4700
	C		4710
3		INTEGER SUB,OMIT,END,TOOBIG	4720
	C		4730
4		LOGICAL NEWR,OTTO	4740
	C		4750
5		DIMENSION DATE(2,3),MT(4),H(4),OMIT(3,3),NAM(3),TOOBIG(3,50)	4760
	C		4770
6		COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	
		1,DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)	
7		COMMON/MISC/ENN,SUMN,TT,50,ATOM(3,101),LLMT(15),R0(15),R0P(15,2)	4800
		1, TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EORAT,FPCT,R,RR,HSUR0,AC(2),AM(2)	4810
		2, HPP(2),RH(2), VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	4820
		3, ANUM(15,5),PFCWT(15),ENTH(15),FAZ(15),RIEMP(15),FOX(15),DENS(15)	4830
		4, RHOP,RHW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACF,SIZE	
8		COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NIM	300
		1, NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEWNR,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	4860
		2, IONS,NC,INSERT,JSOL,JLIQ,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	4870
		3, IOSAVE,LSAVE,ISUP,ISUB,ITNUM	4880
	C		4890
9		EQUIVALENCE (DATE,EN),(OMIT,ENLN),(END,END),(TOOBIG,ENLN)	4900
	C		4910
10		DATA GAS/1HG/,END/3HEND/	4920
	C		4930
11		I2R = 0	4940
12		NC = 0	4950
13		IX = 0	4960
	C		4970
	C	CHECK DIMENSION FOR NUMBER OF SPECIES, CLEAR A(I,J)	4980
	C		4990
14		SUB(1,1) = END	5000
15		DO 3 I=1,1000	5010
16		IF(A(1,I).EQ.END) GO TO 4	5020
17		DO 3 J=1,NLM	5030
18		A(J,I) = 0.	5040
19		3 CONTINUE	5050
20		4 MAXNS = I-1	5060
	C		5070
	C	READ TEMPERATURE RANGES FOR COEFFICIENTS OF GASEOUS SPECIES.	5080
	C		5090
21		READ(4,5) TLOW,TMID,THIGH	5100
22		5 FORMAT (3F10.3)	5110
23		NS = 1	5120
	C		5130
	C	BEGIN LOOP FOR READING SPECIES DATA FROM TAPE.	5140
	C		5150
24		7 READ (4,10) (NAM(I),I=1,3), DATE(1,NS),DATE(2,NS),(MT(J),R(J),	5160
		1 J=1,4),PHAZ,T1,T2	5170

25	10	FORMAT(3A4,6X,2A3,4(A2,F3.0),A1,2F10.3)	5180
26		IF(NAM(1).EQ.END) GO TO 171	5190
27		READ (4,20) ((COEF(I,J,NS),J=1,7),I=1,2)	5200
28	20	FORMAT (5E15,8)	5210
29		IF(NOMIT.EQ.0) GO TO 810	5220
30		DO 805 I=1,NOMIT	5230
31		DO 804 J=1,3	5240
32		IF(OMIT(J,1).NE.NAM(J)) GO TO 805	5250
33	804	CONTINUE	5260
34		GO TO 7	5270
35	805	CONTINUE	5280
36	810	DO 820 K=1,4	5290
37		IF(B(K).EQ.0.) GO TO 825	5300
38		DO 168 I=1,NLM	5310
39		IF(LLMT(I).EQ.MT(K)) GO TO 820	5320
40	168	CONTINUE	5330
41		IF(NS.GT.MAXNS) GO TO 7	5340
42		DO 819 J=1,NLM	5350
43	819	A(J,NS) = 0.	5360
44		GO TO 7	5370
45	820	IF(NS.LE.MAXNS) A(I,NS) = B(K)	5380
46	825	IF(NS.LE.MAXNS) GO TO 828	5390
47		I2B = I2B+1	5400
48		DO 826 I=1,3	5410
49	826	TOOBIG(I,I2B) = NAM(I)	5420
50		GO TO 7	5430
51	828	DO 829 I=1,3	5440
52	829	SUB(NS,I) = NAM(I)	5450
53		IUSE(NS) = 0	5460
54		IF(PHAZ.EQ.GAS) GO TO 170	5470
	C		5480
	C	CONDENSED SPECIES	5490
	C		5500
55		NC= NC+1	5510
56		TEMP(NC,1)= T1	5520
57		TEMP(NC,2)= T2	5530
58		IX= IX+1	5540
59		IF(NS.EQ.1.OR.IUSE(NS-1).EQ.0) GO TO 145	5550
60		DO 830 I=1,NLM	5560
61		IF(A(I,NS).NE.A(I,NS-1)) GO TO 145	5570
62	830	CONTINUE	5580
63		IX= IX-1	5590
64	145	IUSE(NS)= -IX	5600
65	170	NS= NS+1	5610
66		GO TO 7	5620
	C		5630
	C	END CARD HAS BEEN READ.	5640
	C		5650
67	171	NS= NS-1	5660
68		NEWB=.FALSE.	5670
69		IF(I2B.GT.0) GO TO 870	5760
70		RETURN	5770
71	870	WRITE(6,871) I2B	5780
72	871	FORMAT(35H0INSUFFICIENT STORAGE FOR FOLLOWING,13,8H SPECIES)	5790
73		WRITE(6,880) (TOOBIG(I,J),TOOBIG(2,J),TOOBIG(3,J),J=1,I2B)	5800

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74      880 FORMAT(10(3X,3A4))
75      NS = 0
76      RETURN
77      END

```

```

5810
5820
5830
5840

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SYMBOL	-----	REFERENCES	-----
3	-	1500 1700 19*	
4	-	16 20*	
5	-	21RD 22*	
7	-	24* 34 41 44 50 66	
10	-	24RD 25*	
20	-	27RD 28*	
145	-	59 61 64*	
168	-	38D0 40*	
170	-	54 65*	
171	-	26 67*	
804	-	31D0 33*	
805	-	30D0 32 35*	
810	-	29 36*	
819	-	42D0 43*	
820	-	36D0 39 45*	
825	-	37 46*	
826	-	48D0 49*	
828	-	46 51*	
829	-	51D0 52*	
830	-	60D0 62*	
870	-	69 71*	
871	-	71WR 72*	
880	-	73WR 74*	
A	-	6C0 16 18= 43= 45= 61	
AC	-	7C0	
AM	-	7C0	
ANUM	-	7C0	
ATOM	-	7C0	
B	-	5D1 24RD 37 45	
B0	-	7C0	
B0P	-	7C0	
CALCH	-	8C0	
COEF	-	20B 6C0 27RD	
CONVG	-	8C0	
CPCVEQ	-	8C0	
CPCVFR	-	8C0	
CPSUM	-	7C0	
CR	-	7C0	
DATA	-	7C0	
DATF	-	5D1 9EQ 24RD	
DELN	-	20B 6C0	
DENS	-	7C0	
EN	-	20B 6C0 9EQ	
END	-	31N 9EQ 10DA 14 26	
ENDD	-	9EQ 16	
ENLN	-	20B 6C0 9FQ	
ENLSAV	-	7C0	
ENN	-	7C0	
ENNL	-	7C0	
ENSAVE	-	7C0	
ENTH	-	7C0	
EGRAT	-	7C0	
FAZ	-	7C0	

I N D E X

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FOX	-	7C0												
FPCT	-	7C0												
GAS	-	100A	54											
HP	-	8C0												
HPP	-	7C0												
HSURD	-	7C0												
HO	-	20H	6C0											
I	-	1500	16	18	20	24RD	27RD	3000	32	38D0	39	45	48D0	49
		5100	52	6000	61									
IC	-	8C0												
IMAT	-	8C0												
INDX	-	8*												
IONS	-	8C0												
IP	-	8C0												
IOSAVE	-	8C0												
IOI	-	8C0												
ISUH	-	8C0												
ISUP	-	8C0												
ISV	-	8C0												
IT	-	8C0												
ITM	-	8C0												
ITNUM	-	8C0												
IUSE	-	6C0	53=	59	64=									
IX	-	13=	58=	63=	64									
I2H	-	11=	47=	49	69	71WR	73WR							
J	-	1700	18	24RD	27RD	3100	32	4200	43	73WR				
JLIQ	-	8C0												
JSOL	-	8C0												
JSI	-	8C0												
K	-	3600	37	39	45									
KASE	-	8C0												
KMAT	-	8C0												
LLMT	-	7C0	39											
LSAVE	-	8C0												
MAXNS	-	20=	41	45	46									
MISC	-	7*												
MOLES	-	8C0												
MT	-	501	24RD	39										
NAM	-	501	24RD	26	32	49	52							
NAME	-	7C0												
NC	-	8C0	12=	55=	56	57								
NEWB	-	4LG	8C0	68=										
NFZ	-	8C0												
NLM	-	8C0	1700	38D0	4200	6000								
NOF	-	8C0												
NOMIT	-	8C0	29	3000										
NP	-	8C0												
NPP	-	8C0												
NPT	-	8C0												
NREAC	-	8C0												
NS	-	8C0	23=	24RD	27RD	41	43	45	46	52	53	59	61	64
		65=	67=	75=										
NSERT	-	8C0												
NSUR	-	8C0												
NSUP	-	8C0												

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NT	-	8C0			
OF	-	7C0			
OMIT	-	3IN	5D1	9EQ	32
OTTO	-	4LG			
OXF	-	7C0			
PECWT	-	7C0			
PHAZ	-	24RD	54		
PP	-	7C0			
R	-	7C0			
* RETURN	-	70*	76*		
RH	-	7C0			
RHOP	-	7C0			
RMW	-	7C0			
RR	-	7C0			
RTEMP	-	7C0			
S	-	2DB	6C0		
* SEARCH	-	1*			
SHOCK	-	8C0			
SIZE	-	7C0			
SLN	-	6C0			
SP	-	8C0			
* SPECES	-	6*			
SUB	-	3IN	6C0	14=	52=
SUMN	-	7C0			
S0	-	7C0			
TEMP	-	6C0	56=	57=	
THIGH	-	7C0	21RD		
TLN	-	7C0			
TLOW	-	7C0	21RD		
TM	-	7C0			
TMID	-	7C0	21RD		
TOOBIG	-	3IN	5D1	9EQ	49= 73WR
TP	-	8C0			
TRACE	-	7C0			
TT	-	7C0			
T1	-	24RD	56		
T2	-	24RD	57		
VMIN	-	7C0			
VOL	-	8C0			
VPLS	-	7C0			
WP	-	7C0			

1		SUBROUTINE HCALC	5850
	C		5860
	C	CALCULATE PROPERTIES FOR TOTAL REACTANT USING THERMO DATA FOR	5870
	C	ONE OR MORE REACTANTS.	5880
	C		5890
	C		5900
	C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	5910
	C	IBM 360 MACHINES ONLY	5920
	C		5930
2		DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS	5940
3		DOUBLE PRECISION COFF,S,FN,ENLN,H0,DELN	5950
	C		5960
4		LOGICAL MOLES,VOL,SHOCK,CALCH	5970
	C	CALCULATE ENTHALPY FOR PROPELLANT USING COEFFICIENTS	5980
5		DIMENSION NUM(15,5)	5990
	C		6000
6		COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13)	6010
		1 ,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SQNVEL(13),TTT(13)	6020
		2 ,VLM(13),TOTN(13)	6030
7		COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	
		1 ,DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)	
8		COMMON/MISC/ENN,SUMN,TT,S0,ATOM(3,101),LLMT(15),B0(15),BOP(15,2)	6060
		1 ,TN,TLOW,THID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUB0,AC(2),AM(2)	6070
		2 ,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	6080
		3 ,ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTMP(15),FOX(15),DENS(15)	6090
		4 ,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE	
9		COMMON/INDEX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	300
		1 ,NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEWNR,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	6120
		2 ,IONS,NC,NSFRT,JSOL,JLIQ,KASE,NREAC,IC,JS1,VOL,SHOCK,IT,NFZ,CALCH	6130
		3 ,IOSAVE,LSAVE,ISUP,ISUB,ITNUM	6140
	C		6150
10		EQUIVALENCE (ANUM,NUM),(L,NLM),(J,JS1)	6160
11		EQUIVALENCE (AM1,DATA(20)),(CPR1,DATA(21))	6170
12		DATA AG/1HG/,IZERO/2H00/,OX/1H0/,BLK/1H /	6180
	C		6190
13		KOD = 0	6200
14		TSAVE = TT	6210
	C		6220
	C	CALCULATE MOLECULAR WEIGHT OF TOTAL REACTANT, AM1.	6230
	C		6240
15		IF (AM(1).NE.0.0 .AND. AM(2).NE.0.0) GO TO 4	6250
16		AM1= AM(2)	6260
17		IF (AM(2).EQ.0.0) AM1= AM(1)	6270
18		GO TO 9	6280
19		4 AM1=(OF+1.)*AM(1)*AM(2)/(AM(1)+OF*AM(2))	6290
20		9 TM = 0.	6300
21		IF (PP.GT.0.) TM = ALOG(PP*AM1)	6310
22		SSUM(NPT) = 0.	6320
23		HPP(1) = 0.	6330
24		HPP(2) = 0.	6340
25		HSUB0 = 0.	6350
26		CPR1 = 0.	6360
27		ANN = (1.+OF)	6370
	C		6380
	C	LOOP ON REACTANTS.	6390

-----	C	IF OXIDANT, K=1	6400
-----	C	IF FUEL, K=2	6410
-----	C		6420
28		DO 900 N=1,NREAC	6430
29		K=2	6440
30		IF (FOX(N).EQ.OX) K=1	6450
31		IF (NAME(N,5).NE.IZERO) GO TO 89	6460
32		IF (.NOT.CALCH.AND.TT.NF.0.) GO TO 15	6470
33		TT = RTEMP(N)	6480
-----	C		6490
-----	C	IS TT IN RANGE	6500
-----	C		6510
34		15 IF (SHOCK) GO TO 16	6520
35		IF (TT.LT.(TLOW/1.2).OR.TT.GT.(THIGH*1.2)) GO TO 75	6530
36		16 J = NUM(N,5)	6540
37		IF (J.NE.0) GO TO 90	6550
38		DO 10 J=1,L	6560
39		DATA(J)=0.	6570
40		10 CONTINUE	6580
-----	C		6590
-----	C	TEMPORARILY STORE STOICHIOMETRIC COEFFICIENTS IN DATA ARRAY.	6600
-----	C		6610
41		DO 40 I=1,4	6620
42		IF (ANUM(N,I).EQ.0.) GO TO 50	6630
43		DO 20 J=1,L	6640
44		IF (LLMT(J).EQ.NAME(N,I)) GO TO 30	6650
45		20 CONTINUE	6660
46		30 DATA(J)=ANUM(N,I)	6670
47		40 CONTINUE	6680
48		50 IS=0	6690
-----	C		6700
-----	C	SEARCH FOR REACTANT IN THERMO SPECIES. STORE INDEX IN NUM(N,5).	6710
-----	C		6720
49		DO 70 J=1,NS	6730
50		IF (IUSE(J).EQ.0) GO TO 55	6740
51		IS = IS+1	6750
52		IF (FAZ(N).EQ.AG) GO TO 70	6760
53		IF (TT.GT.TEMP(IS,2).AND.TEMP(IS,2).NE.THIGH) GO TO 70	6770
54		IF (TT.LT.TEMP(IS,1).AND.TEMP(IS,1).NE.TLOW) GO TO 70	6780
55		GO TO 56	6790
56		55 IF (FAZ(N).NE.AG.AND.FAZ(N).NE.BLK) GO TO 70	6800
57		56 DO 60 I=1,L	6810
58		IF (A(I,J).NE.DATA(I)) GO TO 70	6820
59		60 CONTINUE	6830
60		NUM(N,5) = J	6840
61		GO TO 90	6850
62		70 CONTINUE	6860
63		GO TO 80	6870
-----	C		6880
-----	C	CALCULATE EN FOR REACTANT AND CALL CPHS TO CALCULATE PROPERTIES.	6890
-----	C		6900
64		89 KOD = 1	6910
65		90 IF (MOLES) ENJ = PECWT(N)/WP(R)	6920
66		IF (.NOT.MOLES) ENJ = PECWT(N)/RMW(N)	6930
67		ENJ = ENJ/ANN	6940

```

68      IF(K.EQ.1) ENJ = ENJ*OF          6950
69      IF(NAME(N,5).NE.IZERO)GO TO 500  6960
70      NSS = NS                          6970
71      NS = J                           6980
72      TLN = ALOG(TT)                   6990
73      IF(.NOT.CALCH) EN(J,NPT) = ENJ    7000
74      CALL CPHS                        7010
75      NS = NSS                         7020
76      IF (H0(J).GT.-.01 .AND. H0(J).LT..01) H0(J) = 0. 7030
77      RTEMP(N) = TT                    7040
78      IF(VOL) H0(J)=H0(J)-1.           7050
79      ENTH(N) = H0(J)*R*TT              7060
      C                                  7070
      C      ADD CONTRIBUTION TO CP, H, AND S OF TOTAL REACTANT. 7080
      C                                  7090
80      CPR1 = CPR1 + CPSUM              7100
81      SSUM(NPT) = SSUM(NPT) + ENJ * (S(J)-ALOG(ENJ)-TM) 7110
82      500 ER = ENTH(N)*ENJ/R            7120
83      HSUB0 = HSUB0+ER                 7130
84      HPP(K) = HPP(K)+ER               7140
85      900 CONTINUE                     7150
86      IF(TSAVE.NE.0.) TT=TSAVE          7160
87      GO TO 1000                        7170
88      75 WRITE(6,76)                   7180
89      76 FORMAT(50H0REACTANT TEMPERATURE OUT OF RANGE OF THERMO DATA ) 7190
90      TT = 0.                          7200
91      GO TO 1000                        7210
92      80 WRITE(6,85) N                  7220
93      85 FORMAT(9H0REACTANT,I2,22H IS NOT IN THERMO DATA ) 7230
94      TT = 0.                          7240
95      1000 IF (KOD.EQ.1) CPR1 = 0.      7250
96      RETURN                           7260
97      END                              7270

```


[illegible]

SUBROUTINE HCALC

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NOMIT	-		9CQ																	
NP	-		9CQ																	
NPP	-		9CQ																	
NPT	-		9CQ		22		73		81											
NREAC	-		9CQ		28DQ															
NS	-		9CQ		49DQ		70		71=		75=									
NSERT	-		9CQ																	
NSS	-		70=		75															
NSUB	-		9CQ																	
NSUP	-		9CQ																	
NT	-		9CQ																	
NUM	-		SU1		10EQ		36		60=											
OF	-		8CQ		19		.27		68											
OX	-		I2DA		30															
OXF	-		8CQ																	
P	-		6CQ																	
PECWT	-		8CQ		65		66													
* POINTS	-		6*																	
PP	-		8CQ		21															
PPP	-		6CQ																	
R	-		8CQ		79		82													
* RETURN	-		96*																	
RH	-		8CQ																	
RHUP	-		8CQ																	
HMW	-		8CQ		66															
RR	-		8CQ																	
RTEMP	-		8CQ		33		77=													
S	-		3DH		7CQ		81													
SHOCK	-		4LG		9CQ		34													
SIZE	-		8CQ																	
SLN	-		7CQ																	
SONVEL	-		6CQ																	
SP	-		9CQ																	
* SPECES	-		7*																	
SSUM	-		2DB		6CQ		22=		81=											
SUB	-		7CQ																	
SUNN	-		8CQ																	
SO	-		8CQ																	
T	-		6CQ																	
TEMP	-		7CQ		53		54													
THIGH	-		8CQ		35		53													
TLN	-		8CQ																	

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SUBROUTINE HCLC

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VPLS - RCO
 WM - 6CO
 WP - 8CO 65

```

1      SUBROUTINE SAVE                                7280
C                                                    7290
C SAVES OR USES COMPOSITIONS FROM PREVIOUS POINT AS INITIAL ESTIMATES 7300
C                                                    7310
C                                                    7320
C THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR 7330
C ... IBM_360_MACHINES ONLY ... 7340
C                                                    7350
2      DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN        7360
C ... 7370
3      LOGICAL VOL,CALCH,IONS,SHOCK                  7380
C                                                    7390
4      COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)
1      DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)
5      COMMON/MISC/FNN,SUMN,TT,SO,ATOM(3,101),LLMT(15),BO(15),ROP(15,2) 7420
1      TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUB0,AC(2),AM(2) 7430
2      HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5) 7440
3      ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTEMP(15),FOX(15),DENS(15) 7450
4      RHOP,RMW(15),TLN,CR,QXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE 7460
6      COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM 300
1      NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEWR,NSUH,NSUP,ITH,CPCVFR,CPCVEQ 7480
2      IONS,NC,NSERT,JSOL,JLIQ,KASE,NREAC,IC,JS1,VOL,SHOCK,IT,NFZ,CALCH 7490
3      IQSAVE,LSAVE,ISUP,ISUB,ITNUM 7500
C                                                    7510
7      EQUIVALENCE (AC(1),JSOLS), (AC(2),JLIQS) 7520
C                                                    7530
C                                                    7540
8      IF (ISV) 100,10,200 7550
C                                                    7560
C NEXT POINT FIRST T IN SCHEDULE, USE PREVIOUS COMPOSITIONS FOR THIS T 7570
C                                                    7580
9      I0 IQ1 = IQSAVE 7590
10     JSOL = JSOLS 7600
11     JLIQ = JLIQS 7610
12     ENN = ENSAVE 7620
13     ENNL = ENLSAV 7630
14     NLM = LSAVF 7640
15     DO 50 J = 1,NS 7650
16     IF (IUSE(J).EQ.0) GO TO 20 7660
17     EN (J,NPT) = SLN(J) 7670
18     IF (IUSE(J).GT.0) IUSE(J) = - IUSE(J) 7680
19     IF (EN(J,NPT).NE.0.) IUSE(J) = -IUSE(J) 7690
20     GO TO 50 7700
21     EN(J,NPT) = 0. 7710
22     ENLN(J) = SLN(J) 7720
23     IF (SLN(J).EQ.0.) GO TO 50 7730
24     IF ((ENLN(J)-ENNL * 18.5).LE.0.) GO TO 50 7740
25     EN(J,NPT) = 2.718281828459**ENLN(J) 7750
26     50 CONTINUE 7760
27     GO TO 1000 7770
C                                                    7780
C FIRST I--SAVE COMPOSITIONS FOR FUTURE POINTS WITH THIS T 7790
C                                                    7800
28     100 ISV = -ISV 7810
29     JSOLS = JSOL 7820

```

```

30      JLIQS = JLIQ
31      IQSAVE = IQI
32      ENSAVE = ENN
33      ENLSAV = ENNL
34      LSAVE = NLM
35      DO 150 J = 1,NS
36      SLN(J) = ENLN(J)
37      IF(IUSF(J).NE.0) SLN(J)=EN(J,ISV)
38      150 CONTINUE
C
C  USE COMPOSITIONS FROM PREVIOUS POINT
C
39      200 DO 300 J = 1,NS
40      EN(J,NPT) = EN(J,ISV)
41      300 CONTINUE
42      1000 RETURN
C
C  CALCULATE NEW VALUES OF B0 AND HSUB0 FOR NEW OF RATIO
C
43      ENTRY NEWOF
C
C
44      EORAT = 0.
45      SUM = OF + 1.
46      V2 = (OF*VMIN(1)+VMIN(2))/SUM
47      V1 = (OF*VPLS(1)+VPLS(2))/SUM
48      IF(V2.NE.0.) EORAT=ABS(V1/V2)
49      IF (RH(1) .NE. 0. .AND. RH(2) .NE. 0.) GO TO 744
50      RHOP = RH(2)
51      IF (RHOP .EQ. 0.) RHOP = RH(1)
52      GO TO 745
53      744 RHOP = (OF+1.)*RH(1)*RH(2)/(RH(1) + OF *RH(2))
54      745 DO 747 I=1,NLM
55      B0(I) = (OF *B0P(I,1) + B0P(I,2))/SUM
56      IF(I.NE.1) GO TO 746
57      BIGB = B0(1)
58      SMALB = B0(1)
59      GO TO 747
60      746 IF(B0(I).EQ.0.) GO TO 747
61      IF(B0(I).LT.SMALB) SMALB=B0(I)
62      IF(B0(I).GT.BIGB) BIGB=B0(I)
63      747 CONTINUE
64      NPT = 1
65      IF(.NOT.CALCH) GO TO 750
66      CALL HCALC
67      IF(TT.EQ.0.) RETURN
68      CALCH = .FALSE.
69      IF(OF.NE.0.) HPP(1)=SUM*HPP(1)/OF
70      HPP(2) = SUM*HPP(2)
71      GO TO 760
72      750 HSUB0= (OF*HPP(1) + HPP(2))/SUM
73      760 IC = 0
74      TEM = SMALB/BIGB
75      SIZE = 18.420681
76      IF(TEM.LT.1.E-5) SIZE=ALOG(1000./TEM)

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7830
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7990
8000
8010
8020
8030
8040
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8080
8090
8100
8110
8120
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8140
8150
8160
8170
8180
8190
8200
8210
8220
8230
8240
8250
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8270
8280
8290
8300
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8350
8360
8370
8380
8390

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I N D E X

SUBROUTINE SAVE

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77 JSOL = 0
78 JLIQ = 0
79 RETURN
80 END

8400
8410
8550
8560

SYMBOL	-----	REFERENCES	-----
10	-	8 9*	
20	-	16 21*	
50	-	1500 20 23 24 26*	
100	-	8 28*	
150	-	3500 38*	
200	-	8 39*	
300	-	3900 41*	
744	-	49 53*	
745	-	52 54*	
746	-	56 60*	
747	-	5400 59 60 63*	
750	-	65 72*	
760	-	71 73*	
1000	-	27 42*	
A	-	400	
* ABS	-	48	
AC	-	500 7F0	
* ALOG	-	76	
AM	-	500	
ANUM	-	500	
ATOM	-	500	
BIGR	-	57= 62 74	
B0	-	500 55= 57 58 60 61 62	
B0P	-	500 55	
CALCH	-	3LG 600 65 68=	
COEF	-	208 400	
CONVG	-	600	
CPCVEQ	-	600	
CPCVFR	-	600	
CPSUM	-	500	
CR	-	500	
DATA	-	500	
DELN	-	208 400	
DENS	-	500	
EN	-	208 400 17= 19 21= 25= 37 40=	
ENLN	-	208 400 22= 24 25 36	
ENLSAV	-	500 13 33=	
ENN	-	500 12= 32	
ENNL	-	500 13= 24 33	
ENSAVE	-	500 12 32=	
ENTH	-	500	
EORAT	-	500 44= 48=	
FAZ	-	500	
FOX	-	500	
FPCT	-	500	
* HCALC	-	66*	
HP	-	600	
HPP	-	500 69= 70= 72	
HSUR0	-	500 72=	
H0	-	208 400	
I	-	5400 55 56 60 61 62	
IC	-	600 73=	
IMAT	-	600	

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I N D E X

SUBROUTINE SAVE

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	SHOCK	-	3LG	600					
	SIZE	-	500	75=	76=				
	SLN	-	400	17	22	23	36=	37=	
	SMALB	-	58=	61	74				
	SP	-	600						
*	SPECES	-	4*						
	SUB	-	400						
	SUM	-	45=	46	47	55	69	70	72
	SUMN	-	500						
	SO	-	500						
	TEM	-	74=	76					
	TEMP	-	400						
	THIGH	-	500						
	TLN	-	500						
	TLOW	-	500						
	TM	-	500						
	TMID	-	500						
	TP	-	600						
	TRACE	-	500						
	TT	-	500	67					
	VMIN	-	500	46					
	VOL	-	3LG	600					
	VPLS	-	500	47					
	V1	-	47=	48					
	V2	-	46=	48					
	WP	-	500						

.....

1	C	SUBROUTINE EQLBRM	8590
	C	ROUTINE TO CALCULATE EQUILIBRIUM COMPOSITION AND PROPERTIES	8600
2	C	DOUBLE PRECISION X,G,SUM,SUM2,E	8610
	C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	8620
	C	IBM 360 MACHINES ONLY	8630
3	C	DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPI,GAMMAS	8640
4	C	DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN	8650
5	C	DOUBLE PRECISION ENL,PROW,DLNT,AA	8660
6	C	LOGICAL HP,SP,IP,CONVG,IONS,SINGC,LOGV,ISING,I35,VOL,SHOCK,HITF	8670
	C		8680
7	C	COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPI(13)	8690
	C	1 ,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13)	8700
	C	2 ,VLM(13),TOTN(13)	8710
8	C	COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	8720
	C	1 ,DELN(115),A(15,115),SUR(115,3),IUSE(115),TEMP(50,2),SLN(115)	8730
9	C	COMMON/MISC/ENN,SUMN,IT,S0,ATOM(3,101),LLMT(15),B0(15),B0P(15,2)	8740
	C	1 ,TM,TLOW,IMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUB0,AC(2),AM(2)	8750
	C	2 ,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	8760
	C	3 ,ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTMP(15),FOX(15),DENS(15)	8770
	C	4 ,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE	8780
10	C	COMMON /DOUBLE/ G(20,21), X(20)	8790
11	C	COMMON/INDEX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	8800
	C	1 ,NS,KMAT,IMAT,IQ,NOF,NOMIT,IP,NEW,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	8810
	C	2 ,IONS,NC,INSERT,JSOL,JLID,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	8820
	C	3 ,IQSAVE,LSAVE,ISUP,ISUR,ITNUM	8830
12	C	EQUIVALENCE (NLM,L),(LOGV,CPCVEQ)	8840
13	C	DATA IE/IHE/,SMALNO/1,E-6/,SMNOL/-13.815511/,ITN/35/	8850
14	C	SINGC = .FALSE.	8860
15	C	PIE = 0.	8870
16	C	I35 = .FALSE.	8880
17	C	E = 2.718281828459	8890
18	C	ENL = ENNL	8900
19	C	ISING = .FALSE.	8910
20	C	LOGV = .FALSE.	8920
21	C	IF (.NOT.VOL) GO TO 6	8930
22	C	RV = RR/101.325	8940
23	C	PP = RV*ENN*TT/VLM(NPT)	8950
24	C	6 TLN = ALOG(TT)	8960
25	C	CONVG = .FALSE.	8970
26	C	ITNUMB = ITN	8980
27	C	JSI = 1	8990
28	C	CALL CPHS	9000
29	C	TM = ALOG(PP/ENN)	9010
30	C	IF (.NOT.IONS.OR.IE.EQ.LLMT(1)) GO TO 43	9020
31	C	L = L+1	9030
32	C	IQ1 = IQ1+1	9040

```

33      DO 499 J = 1,NS                      9160
34      IF (A(L,J) .EQ.0.) GO TO 499          9170
35      EN(J,NPT) = 1.E-8                     9180
36      ENLN(J) = -SIZE                       9190
37      499 CONTINUE                          9200
C                                           9210
C      BEGIN ITERATION                      9240
C                                           9250
38      43 IF (.NOT.CONVG) GO TO 62           9260
39      SUMN = ENN                            9270
40      IF (JSOL.EQ.0) GO TO 62               9280
41      ENSOL = EN(JSOL,NPT)                 9290
42      EN(JSOL,NPT) = EN(JSOL,NPT)+EN(JLIO,NPT) 9300
43      IUSE(JLIO) = -IUSE(JLIO)             9310
44      IQ1 = IQ1+1                          9320
45      DLVTP(NPT) = 0.                      9330
46      CPR(NPT) = 0.                       9340
47      GAMMAS(NPT) = 0.                    9350
48      LOGV = .TRUE.                       9360
49      62 CALL MATHIX                       9370
50      NUMB = ITN-ITNUMB+1                  9380
51      IQ2 = IQ1 + 1                       9390
52      IF (CONVG) IMAT=IMAT-1               9400
53      72 ITST = IMAT                      9520
54      CALL GAUSS                          9530
55      IF (ITST.NE.IMAT) GO TO 774          9540
56      773 IF (.NOT.CONVG) GO TO 85         9600
57      IF (.NOT.LOGV) GO TO 174             9610
58      GO TO 171                            9620
C                                           9630
C      TEMPERATURE DERIVATIVES--CONVG=T, LOGV=F 9640
C                                           9650
59      174 DLVTP(NPT) = 1.-X(IQ1)           9660
60      IF (DLVTP(NPT).LT.25.) GO TO 175 .   9670
61      DLVTP(NPT) = 0.                     9680
62      DLVTP(NPT) = 0.                     9690
63      CPR(NPT) = 0.                       9700
64      GAMMAS(NPT) = 0.                    9710
65      GO TO 186                           9720
66      175 CPR(NPT) = G(IQ2,IQ2)            9730
67      DO 176 J=1,IQ1                      9740
68      CPR(NPT) = CPR(NPT)-G(IQ2,J)*X(J)    9750
69      176 CONTINUE                        9760
C                                           9770
C      PRESSURE DERIVATIVE--CONVG=T, LOGV=T   9780
C                                           9790
70      LOGV = .TRUE.                      9800
71      GO TO 62                            9810
C                                           9820
C      SINGULAR MATRIX                      9830
C                                           9840
72      774 IF (.NOT.CONVG) GO TO 775       9850
73      WRITE(6,172)                        9860
74      177 FORMAT(28HODERIVATIVE MATRIX SINGULAR ) 9870
75      GO TO 171                          9880

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76      775 IF(.NOT.HP.OR.NPT.NE.1.OR.NC.EQ.0.OR.TT.GT.100.) GO TO 871      9890
77      WRITE(6,874)                                                         9900
78      874 FORMAT(96H0LOW TEMPERATURE IMPLIES CONDENSED SPECIES SHOULD HAVE  9910
      18EEN INCLUDED ON AN INSERT CARD, RESTART )                          9920
79      GO TO 873                                                            9930
80      871 WRITE(6,74)                                                       9940
81      74 FORMAT(16H0SINGULAR MATRIX)                                       9950
82      IF(SINGC) GO TO 873                                                  9960
83      DO 970 JJ = 1, NS                                                    9970
84      IF(IUSE(JJ).NE.0) GO TO 970                                         9980
85      IF(EN(JJ,NPT).NE.0.) GO TO 970                                     9990
86      EN(JJ,NPT) = SMALNO                                                  10000
87      ENLN(JJ) = SMNOL                                                     10010
88      970 CONTINUE                                                         10020
89      IF(SINGC) GO TO 870                                                  10030
90      ISING = .TRUE.                                                       10040
91      WRITE (6,776)                                                         10050
92      776 FORMAT (8H0RESTART)                                             10060
93      GO TO 62                                                             10070
94      C                                                                      10080
95      C TEST FOR SINGULARITY TO CONDENSED SPECIES.                        10090
96      C                                                                      10100
97      870 NCOND = IQ1-NLM-2                                               10110
98      IF(TP.OR.VOL) NCOND=NCOND+1                                         10120
99      IF(NCOND.LT.2.OR.SIZFG.EQ.0.) GO TO 873                             10130
100     DO 872 J=1,NS                                                        10140
101     IF(IUSE(J).LE.0) GO TO 872                                           10150
102     IF(J.EQ.JDELG) GO TO 872                                             10160
103     DO 671 I=1,NLM                                                        10170
104     IF(A(I,J).EQ.A(I,JDELG)) GO TO 671                                   10180
105     IF(A(I,J).EQ.0..OR.A(I,JDELG).EQ.0.) GO TO 872                     10190
106     671 CONTINUE                                                         10200
107     SINGC = .TRUE.                                                       10210
108     IQ1 = IQ1-1                                                           10220
109     EN(J,NPT) = 0.                                                       10230
110     IUSE(J) = -IUSE(J)                                                  10240
111     872 CONTINUE                                                         10250
112     IF(SINGC) GO TO 40                                                    10260
113     GO TO 873                                                            10270
114     C                                                                      10280
115     C OBTAIN CORRECTIONS TO THE ESTIMATES                               10290
116     C                                                                      10300
117     85 ITNUMB= ITNUMB-1                                                  10310
118     KK = L + 1                                                           10320
119     IF(VOL) X(IQ2)=X(IQ1)                                                10330
120     IF(TP) X(IQ2)=0.                                                     10340
121     DLNT= X(IQ2)                                                         10350
122     SUM = X(IQ1)                                                         10360
123     IF(.NOT.VOL) GO TO 97                                                10370
124     X(IQ1) = 0.                                                          10380
125     SUM = -DLNT                                                         10390
126     DO 101 J=1,NS                                                        10400
127     IF(IUSE(J)) 101,98,100                                              10410
128     98 DELN(J) = H0(J)*DLNT-H0(J)+S(J)-ENLN(J)-TM*SUM                 10420
129     DO 99 K=1,L                                                         10430

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124      DELN(J)= DFLN(J)+A(K,J)*X(K)          10440
125      99 CONTINUE                          10450
126      IF (PIE.NE.0.) DELN(J)=DFLN(J)+A(L+1,J)*PIE 10460
127      GO TO 101                             10470
128      100 DELN(J) = X(KK)                   10480
129      KK = KK + 1                           10490
130      101 CONTINUE                          10500
      C                                       10510
      C      CALCULATE CONTROL FACTOR,AMRDA    10520
      C                                       10530
131      AMRDA= 1.                             10540
132      AMRDA1= 1.                            10550
133      SUM = X(IQ1)                          10560
134      IF (SUM.LT.0.) SUM=-SUM                10570
135      IF (DLNT.GT.SUM) SUM=DLNT              10580
136      IF (-DLNT.GT.SUM) SUM=-DLNT            10590
137      DO 917 J=1,NS                         10600
138      IF (IUSE(J).NE.0) GO TO 917            10610
139      IF ((EN(J,NPT).GT.0.) .AND. DELN(J).GT.SUM) SUM = DELN(J) 10620
140      IF ((EN(J,NPT).NE.0.) .OR. DELN(J).LE.0.) GO TO 917 10630
141      SUM1 = (-9.212-ENLN(J)+ ENL)/(DELN(J)-X(IQ1)) 10640
142      IF (SUM1.LT.0.) SUM1=-SUM1             10650
143      IF (SUM1.LT.AMRDA1) AMRDA1 = SUM1      10660
144      917 CONTINUE                          10670
145      IF (SUM.GT.2.)AMRDA=2./SUM             10680
146      IF (AMRDA1.LT.AMRDA) AMRDA = AMRDA1    10690
      C                                       10920
      C      APPLY CORRECTIONS TO ESTIMATES    10930
      C                                       10940
147      111 SUM = 0.                         10950
148      DO 113 J=1,NS                         10960
149      IF (IUSE(J)) 113,112,114              10970
150      112 ENLN(J)=ENLN(J)+AMRDA*DELN(J)      10980
151      EN(J,NPT) = 0.                        10990
152      IF ((ENLN(J)- ENL+SIZE).LE.0.) GO TO 113 11000
153      EN(J,NPT) = E**ENLN(J)                11010
154      SUM = SUM+EN(J,NPT)                   11020
155      GO TO 113                             11030
156      114 EN(J,NPT) = EN(J,NPT) + AMRDA * DELN(J) 11040
157      113 CONTINUE                          11050
158      SUMN = SUM                            11060
159      IF (TP) GO TO 115                      11070
160      TLN= TLN+AMRDA*DLNT                    11080
161      TT = EXP(TLN)                         11090
162      JS1 = 1                               11100
163      CALL CPHS                              11110
164      115 IF (VOL) GO TO 2115                11120
165      ENL = ENL+AMRDA*X(IQ1)                 11130
166      ENN = E**ENL,                          11140
167      GO TO 1115                             11150
168      2115 ENN = SUMN                        11160
169      ENL = ALOG(ENN)                        11170
170      PP = RV*TT*ENN/VLM(NPT)                11180
171      1115 TM = ALOG(PP/ENN)                 11190
172      IF (LLMT(L).NE.IE) GO TO 116          11200

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C -----
C CHECK ON REMOVING IONS -----
C -----
173 DO 1116 J=1,NS -----
174 IF (A(L,J).EQ.0.) GO TO 1116 -----
175 IF (EN(J,NPT).GT.0.) GO TO 1116 -----
176 1116 CONTINUE -----
177 PIE = X(L) -----
178 L = L-1 -----
179 IQ1 = IQ1-1 -----
180 GO TO 43 -----
C -----
C TEST FOR CONVERGENCE -----
C -----
181 116 IF (ITNUMB.EQ.0) GO TO 14 -----
182 IF (AMDBA.LI.1) GO TO 43 -----
183 SUM = X(IQ1) -----
184 IF (SUM.LT.0.) SUM = -SUM -----
185 IF (SUM.GT.0.5E-5) GO TO 43 -----
186 DO 130 J=1,NS -----
187 IF (IUSE(J).LT.0) GO TO 130 -----
188 AA= DELN(J)/SUMN -----
189 IF (AA.LT.0.) AA=-AA -----
190 IF (IUSE(J).EQ.0) AA = AA*EN(J,NPT) -----
191 IF (AA.GT.0.5E-5) GO TO 43 -----
192 130 CONTINUE -----
193 LE = L -----
194 IF (TRACE.EQ.0.) GO TO 275 -----
195 IF (ITN.GT.35) GO TO 222 -----
196 ITN = ITN+15 -----
197 ITNUMB = ITNUMB+15 -----
198 222 DO 225 I=1,NLM -----
199 IF (B0(I).EQ.0.) GO TO 227 -----
200 SUM = 0. -----
201 DO 223 J=1,NS -----
202 223 SUM = SUM+EN(J,NPT)*A(I,J) -----
203 TSUM = SUM -----
204 IF (ABS(B0(I)-TSUM)/B0(I).GT..0001) GO TO 43 -----
205 225 CONTINUE -----
206 227 IF (.NOT.IONS) GO TO 275 -----
C -----
C CHECK ON ELECTRON BALANCE -----
C -----
207 IF (PIE.NE.0.) LE=L+1 -----
208 IF (PIE.EQ.0.) PIE=X(L) -----
209 ITER = 1 -----
210 229 SUM2 = 0. -----
211 SUM = 0. -----
212 DO 230 J=1,NS -----
213 IF (IUSE(J).LT.0.OR.A(LE,J).EQ.0.) GO TO 230 -----
214 IF (ENLN(J).GT.-87.) EN(J,NPT)=E*ENLN(J) -----
215 AN = A(LE,J)*EN(J,NPT) -----
216 IF (EN(J,NPT)/ENN.GT.1.E-7) GO TO 275 -----
217 SUM = SUM+AN -----
218 SUM2 = SUM2+AN*A(LE,J) -----

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219      230 CONTINUE                                11760
220      IF(SUM2.EQ.0.) GO TO 275                    11770
221      DPIE = -SUM/SUM2                            11780
222      DO 250 J=1,NS                               11790
223      IF(A(LE,J).EQ.0.) GO TO 250                 11800
224      ENLN(J) = FNLN(J)+A(LE,J)*DPIE              11810
225      250 CONTINUE                                11820
226      IF(ABS(DPIE).LT..0001) GO TO 275            11830
227      PIE = PIE+DPIE                              11840
228      ITER = ITER+1                                11850
229      IF(ITER.LE.1TN) GO TO 229                   11860
230      WRITE(6,260)                                11870
231      260 FORMAT(37H0DID NOT CONVERGE ON ELECTRON BALANCE) 11880
232      GO TO 873                                    11890
233      275 CONTINUE                                11900
C                                                11910
C      CALCULATE ENTROPY, CHECK ON DELTA S FOR SP PROBLEMS 11920
C                                                11930
234      TOTN(NPT) = 0.                              11940
235      SSUM(NPT) = 0.                              11950
236      DO 183 J=1,NS                               11960
237      IF(IUSE(J).LT.0) GO TO 183                   11970
238      TOTN(NPT) = TOTN(NPT) + EN(J,NPT)            11980
239      SS = S(J)                                    11990
240      IF(IUSE(J).EQ.0) SS=SS-ENLN(J)-TM            12000
241      SSUM(NPT) = SSUM(NPT)+SS*EN(J,NPT)           12010
242      183 CONTINUE                                12020
243      IF(.NOT.SR) GO TO 13                          12030
244      SS = SSUM(NPT) -S0                            12040
245      IF(SS.LT.(-0.00005).OR.SS.GT.0.00005) GO TO 43 12050
C                                                12080
246      13 CONVG= .TRUE.                             12090
247      GO TO 160                                    12100
248      14 WRITE(6,973) IYN,NPT                       12110
249      973 FORMAT(14H12.69H ITERATIONS DID NOT SATISFY CONVERGENCE REQUIREME 12120
      INTS FOR THE POINT 15)                        12130
250      IF(NC.EQ.0.OR.I35) GO TO 873                 12140
251      I35 = .TRUE.                                 12150
252      IF (.NOT.HP.OR.NPT.NE.1.OR.IT.GT.100.) GO TO 261 12160
253      WRITE(6,874)                                  12170
254      GO TO 873                                     12180
255      261 NCOND = IQ1-NLM-2                          12190
256      IF(IP.OR.VOL) NCOND=NCOND+1                  12200
257      IF(NCOND.NE.1.OR.ENN.GT.1.E-4) GO TO 873      12210
C HIGH TEMPERATURE, INCLUDED CONDENSED CONDITION 12220
258      WRITE(6,265)                                  12230
259      265 FORMAT(31H0TRY REMOVING CONDENSED SPECIES) 12240
260      ENN = .1                                       12250
261      ENL = -2.302585J                              12260
262      SUMN = ENN                                     12270
263      XI = NS - NC                                  12280
264      XI = ENN/XI                                    12290
265      XLN = ALOG(XI)                                12300
266      DO 432 J=1,NS                                12310
267      IF(IUSE(J).GT.0) IUSE(J)=-IUSE(J)            12320

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268	EN(J,NPT) = 0.	12130
269	ENLN(J) = 0.	12140
270	IF (IUSE(J).NE.0) GO TO 432	12350
271	EN(J,NPT) = XI	12360
272	ENLN(J) = XLN	12370
273	432 CONTINUE	12380
274	IG1 = NLN+1	12390
275	GO TO 40	12400
	C	12410
	C CONVERGENCE TESTS ARE SATISFIED: TEST CONDENSED SPECIES.	12420
	C	12430
276	160 IF (NC.EQ.0) GO TO 143	12440
277	DO 146 J=1,NS	12450
278	IF (EN(J,NPT).GE.0.) GO TO 146	12460
279	IF (J.NE.JSOL .AND. J.NE.JLIQ) GO TO 147	12470
280	JSOL = 0	12480
281	JLIQ = 0	12490
282	147 IG1 = IG1 + 1	12500
283	EN(J,NPT) = 0.	12510
284	GO TO 166	12520
285	146 CONTINUE	12530
286	SIZEG = 0.	12540
287	INC = 0	12550
288	DO 170 J = 1,NS	12560
289	IF (IUSE(J).EQ.0) GO TO 170	12570
290	INC = INC + 1	12580
291	144 FORMAT (1H0,3A4,2F10.3,3X,SHIUSE=,I4,E15.7)	12610
292	IF (EN(J,NPT).GT.0.) GO TO 149	12620
293	KG = 1	12630
294	IF (IUSE(J).EQ.-IUSE(J+1)) GO TO 154	12640
295	IF (J.EQ.1.OR.IUSE(J).NE.-IUSE(J-1)) GO TO 153	12650
296	KG = -1	12660
297	154 JKG = J + KG	12670
298	TMELT = TEMP(INC,1)	12680
299	IMP = INC + KG	12690
300	IF (TMELT.EQ.TEMP(IMP,2)) GO TO 158	12700
301	TMELT = TEMP(INC,2)	12710
302	IF (TMELT.EQ.TEMP(IMP,1)) GO TO 157	12720
303	WRITE (6,156)	12730
304	156 FORMAT (50H03 PHASES OF A CONDENSED SPECIES ARE OUT OF ORDER)	12740
305	GO TO 873	12750
	C	12760
	C JTH SPECIES A SOLID (EN=0), (J+KG)TH SPECIES A LIQUID (EN IS +)	12770
	C	12780
306	157 IF (IT.GT.TMELT) GO TO 169	12790
307	IF (IP.AND.IT.EQ.TMELT) GO TO 169	12800
308	IF (IP) GO TO 1165	12810
309	IF (IT.LE.TMELT-150.) GO TO 1165	12820
310	JSOL = J	12830
311	JLIQ = JKG	12840
312	GO TO 159	12850
	C	12860
	C JTH SPECIES A LIQUID (EN=0), (J+KG)TH SPECIES A SOLID (EN IS +)	12870
	C	12880
313	158 IF (IT.LT.TMELT) GO TO 169	12890

314	IF (TP.AND.TT.EQ.TMELT) GO TO 169	12900
315	IF (TP) GO TO 1165	12910
316	IF (TT.GE.TMELT+150.) GO TO 1165	12920
317	JSOL = JKG	12930
318	JLIQ = J	12940
319	159 TLN = ALOG (TMELT)	12950
320	TT = TMELT	12960
321	EN(JKG,NPT) = .5 * EN(JKG,NPT)	12970
322	EN(J,NPT) = EN(JKG,NPT)	12980
323	GO TO 165	12990
	C	13000
	C WRONG PHASE INCLUDED FOR T INTERVAL, SWITCH EN	13010
	C	13020
324	1165 EN(J,NPT) = EN (JKG, NPT)	13030
325	IUSE(J) = -IUSE(J)	13040
326	IUSE (JKG) = -IUSE(JKG)	13050
327	EN(JKG,NPT) = 0.	13060
328	GO TO 40	13070
329	153 IF (TT.LT.TEMP(INC,1) .AND.TEMP(INC,1).NE.TLOW) GO TO 169	13080
330	IF (TT.GT.TEMP(INC,2)) GO TO 169	13090
	C	13100
	C	13110
331	SUM = 0.	13120
332	DO 167 I = 1,L	13130
333	SUM = SUM + A(I,J)*X(I)	13140
334	167 CONTINUE	13150
335	DELG = H0(J)-S(J)-SUM	13160
336	IF (DELG.GE.SIZEG .OR. DELG.GE.0.) GO TO 169	13190
337	SIZEG = DELG	13200
338	JDELG = J	13210
339	169 IF (INC.EQ.NC) GO TO 1160	13220
340	170 CONTINUE	13230
341	1160 IF (SIZEG.EQ.0.) GO TO 143	13240
342	J = JDELG	13250
343	165 I01 = I01 + 1	13260
344	166 IUSE(J) = - IUSE(J)	13270
345	40 CONVG = .FALSE.	13280
346	JS1 = 1	13290
347	CALL CPHS	13300
348	143 TN = NUMB	13310
349	IF (PIE.NE.0.) X(LE) = PIE	13320
350	JS1 = 1	13350
351	IF (TP.AND.CONVG) CALL CPHS	13360
352	ITNUMB = ITN	13370
353	GO TO 43	13380
	C	13390
	C CALCULATE EQUILIBRIUM PROPERTIES	13400
	C	13410
	C	13420
354	1171 DLVPT(NPT) = -1.	13430
355	DLVTP(NPT) = 1.	13440
356	CPR(NPT) = CPSUM	13450
357	GO TO 199	13460
358	171 DLVPT(NPT) = -1. + X(I01)	13470
359	IF (JLIQ.EQ.0) GO TO 199	13480

```

360 ----- EN(JSOL,NPT) = ENSOL ----- 13490
361 ----- IUSE(JLIQ) = -IUSE(JLIQ) ----- 13500
362 ----- HSUM(NPT) = HSUM(NPT)+EN(JLIQ,NPT)*(H0(JLIQ)-H0(JSOL)) ----- 13510
363 ----- IQ1 = IQ1+1 ----- 13520
364 ----- GAMMAS(NPT) = -1./DI VPT(NPT) ----- 13530
365 ----- GO TO 186 ----- 13540
366 ----- 199 GAMMAS(NPT) = -1./ (DLVPT(NPT)+(DLVPT(NPT)**2)*ENN/CPR(NPT)) ----- 13550
367 ----- 186 TTT(NPT) = TT ----- 13560
368 ----- ENNL = ENL ----- 13570
369 ----- PPP(NPT) = PP ----- 13580
370 ----- VLM(NPT) = RR*ENN*TT/(101.325*PP) ----- 13590
371 ----- HSUM(NPT) = HSUM(NPT)*TT ----- 13600
372 ----- WM(NPT) = 1./ENN ----- 13610
373 ----- IF (TRACE.EQ.0.) GO TO 200 ----- 13620
374 ----- DO 1200 J=1,NS ----- 13630
375 ----- IF (IUSE(J).NE.0) GO TO 1200 ----- 13640
376 ----- IF (ENLN(J).GT.-87.) EN(J,NPT)=E*ENLN(J) ----- 13650
377 ----- 1200 CONTINUE ----- 13660
378 ----- 200 IF (TT.GE.TLOW.AND.TT.LE.THIGH.OR.SHOCK) GO TO 1000 ----- 13730
379 ----- WRITE (6,306) TT,NPT ----- 13740
380 ----- 306 FORMAT (17H0THE TEMPERATURE=E12.4,26H IS OUT OF RANGE FOR POINT,15) ----- 13750
381 ----- IF (TT.GE.TLOW/1.5.AND.TT.LE.THIGH*.25) GO TO 1000 ----- 13760
382 ----- NPT = NPT+1 ----- 13770
----- C ----- 13780
----- C ----- 13790
----- C ----- 13800
383 ----- 873 TT=0. ----- 13810
384 ----- NPT = NPT-1 ----- 13820
385 ----- 1000 RETURN ----- 13830
386 ----- END ----- 13840

```

SYMBOL	-----	REFERENCES	-----
6	- 21	24*	
13	- 243	246*	
14	- 181	248*	
40	- 109	275	328 345*
43	- 30	38*	180 182 185 191 204 245 353
62	- 38	40	49* 71 93
72	- 53*		
74	- 80WR	81*	
85	- 56	111*	
97	- 117	120*	
98	- 121	122*	
99	- 12300	125*	
100	- 121	128*	
101	- 12000	121	127 130*
111	- 147*		
112	- 149	150*	
113	- 14800	149	152 155 157*
114	- 149	156*	
115	- 159	164*	
116	- 172	175	181*
130	- 18600	187	192*
143	- 276	341	348*
144	- 291*		
146	- 27700	278	285*
147	- 279	282*	
153	- 295	329*	
154	- 294	297*	
156	- 303WR	304*	
157	- 302	306*	
158	- 300	313*	
159	- 312	319*	
160	- 247	276*	
165	- 323	343*	
166	- 284	344*	
167	- 33200	334*	
169	- 292	306	307 313 314 329 330 336 339*
170	- 28800	289	340*
171	- 58	358*	
172	- 73WR	74*	
174	- 57	59*	
175	- 60	66*	
176	- 6700	69*	
183	- 23600	237	242*
186	- 65	365	367*
199	- 357	359	366*
200	- 373	378*	
222	- 195	198*	
223	- 20100	202*	
225	- 19800	205*	
227	- 199	206*	
229	- 210*	229	
230	- 21200	213	219*
250	- 22200	223	225*

I N D E X

SUBROUTINE EWLHRM

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DLNT	-	SDR	115=	119	122	135	136	160						
DLVPT	-	3DR	7CO	62=	354=	358=	364	366						
DLVTP	-	3DB	7CO	45=	59=	60	61=	355=	366					
* UOUHLF	-	10*												
DPIF	-	221=	224	226	227									
E	-	2DH	17=	153	166	214	376							
EN	-	4DH	8CO	35=	41	42=	85	86=	106=	139	140	151=	153=	154
	-	156=	175	190	202	214=	215	216	238	241	268=	271=	278	283=
	-	292	321=	322=	324=	327=	360=	362	376=					
ENL	-	5DH	18=	141	152	165=	166	169=	261=	368				
ENLN	-	4DH	8CO	36=	87=	122	141	150=	152	153	214	224=	240	269=
	-	272=	376											
ENLSAV	-	9CO												
ENN	-	9CO	23	29	39	166=	168=	169	170	171	216	257	260=	262
	-	264	366	370	372									
ENNI	-	9CO	1A	368=										
ENSAVF	-	9CO												
ENSOL	-	41=	360											
ENTH	-	9CO												
* EQLRRM	-	1*												
* EGRAT	-	9CO												
* EXP	-	161												
FAZ	-	9CO												
FOX	-	9CO												
FPCT	-	9CO												
G	-	2DB	10CO	66	68									
* GAMMAS	-	3DB	7CO	47=	64=	364=	366=							
* GAUSS	-	54*												
HP	-	6LG	11CO	76	252									
HPP	-	9CO												
HSUR0	-	9CO												
HSUM	-	3DB	7CO	362=	371=									
HQ	-	4DB	8CO	122	335	362								
I	-	10000	101	102	19800	199	202	204	33200	333				
IC	-	11CO												
IF	-	13DA	30	172										
IMAT	-	11CO	52=	53	55									
IMP	-	249=	300	302										
INC	-	287=	290=	298	299	301	329	330	339					
* INDX	-	11*												
IONS	-	6LG	11CO	30	206									
IP	-	11CO												
IOSAVF	-	11CO												
IO1	-	11CO												
	-	165	32=	44=	51	59	6700	94	105=	113	116	118	133	141
IO2	-	51=	179=	183	255	274=	282=	343=	358	363=				
ISING	-	6LG	66	68	113	114	115							
ISUH	-	11CO	19=	89	90=									
ISUP	-	11CO												
ISV	-	11CO												
IT	-	11CO												
ITER	-	209=	229=	229										
ITM	-	11CO												
ITN	-	13DA	26	50	195	196=	229	248WR	352					
ITNUM	-	11CO												

ITNUMR	-	.26=	50	111=	181	197=	352=										
ITST	-	53=	55														
IUSE	-	800	43=	84	98	107=	121	138	149	187	190	213	237	240			
	-	267	270	289	294	295	325=	326=	344=	361=	375						
I35	-	6LG	16=	250	251=												
J	-	3300	34	35	36	6700	68	9700	98	99	101	102	106	107			
	-	12000	121	122	124	126	128	13700	138	139	140	141	14800	149			
	-	150	151	152	153	154	156	17300	174	175	18600	187	188	190			
	-	20100	202	21200	213	214	215	216	218	22200	223	224	23600	237			
	-	238	239	240	241	26600	267	268	269	270	271	272	27700	278			
	-	279	283	28800	289	292	294	295	297	310	318	322	324	325			
	-	333	335	338	342=	344	37400	375	376								
	-	THE VARIABLE JOELG IS USED BEFORE IT IS DEFINED															
JOELG	-	99	101	102	338=	342											
JJ	-	8300	84	85	86	87											
JKG	-	297=	311	317	321	322	324	326	327								
JLIO	-	1100	42	43	279	281=	311=	318=	359	361	362						
JSOL	-	1100	40	41	42	279	280=	310=	317=	360	362						
JSI	-	1100	27=	162=	346=	350=											
K	-	12300	124														
KASF	-	1100															
KG	-	293=	296=	297	299												
KK	-	112=	128	129=													
KMAT	-	1100															
L	-	12EQ	30	31=	34	112	12300	126	172	174	177	178=	193	207			
	-	208	33200														
LF	-	193=	207=	213	215	218	223	224	349								
LLMT	-	900	30	172													
LOGV	-	6LG	12EQ	20=	48=	57	70=										
LSAVE	-	1100															
MATRIX	-	49*															
MISC	-	9*															
MOLFS	-	1100															
NAME	-	900															
NC	-	1100	76	250	263	276	339										
NCOND	-	94=	95=	96	255=	256=	257										
NEWNR	-	1100															
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NLM	-	1100	12EQ	94	10000	19800	255	274									
NOF	-	1100															
NOMIT	-	1100															
NP	-	1100															
NPP	-	1100															
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	-	64	66	68	76	85	86	106	139	140	151	153	154	156			
	-	170	175	190	202	214	215	216	234	235	238	241	244	248WR			
	-	252	268	271	278	283	292	321	322	324	327	354	355	356			
	-	358	360	362	364	366	367	369	370	371	372	376	379WR	382=			
	-	384=															
NREAC	-	1100															
NS	-	1100	3300	8300	9700	12000	13700	14800	17300	18600	20100	21200	22200	23600			
	-	263	26600	27700	28800	37400											
NSERT	-	1100															
NSUB	-	1100															
NSUP	-	1100															

[illegible]

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SUBROUTINE EQLBRM

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V	-	7CO										
VLM	-	7CO	23	170	370=							
VMIN	-	9CO										
VOL	-	6LG	11CO	21	95	113	117	164	256			
VPLS	-	9CO										
WM	-	7CO	372=									
WP	-	9CO										
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		165	177	183	208	333	349=	358				133
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XLN	-	265=	272									

1	SUBROUTINE CPHS	13850
C	CALCULATES THERMODYNAMIC PROPERTIES FOR INDIVIDUAL SPECIES	13860
C		13870
C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	13880
C	IBM 360 MACHINES ONLY	13890
C		13900
2	DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN	13910
C		13920
C		13930
3	COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	
4	1,DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)	
4	COMMON/MISC/ENNSUMN,TT,S0,ATOM(3,101),LLMT(15),R0(15),R0P(15,2)	13960
4	1,TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUB0,AC(2),AM(2)	13970
4	2,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	13980
4	3,ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTEMP(15),FOX(15),DENS(15)	13990
4	4,RHDP,RMW(15),TLN,CP,OXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE	
5	COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	300
5	1,NS,KMAT,IMAT,IQ1,NDF,NOMIT,IP,NEWNR,NSUB,NSUP,ITM,CPCVFR,CPCVED	14020
5	2,IONS,NC,NSERT,JSOL,JL TO,KASE,NREAC,IC,J51,VOL,SHOCK,IT,NFZ,CALCH	14030
5	3,IQSAVE,LSAVE,ISUP,ISUB,ITNUM	14040
C		14050
6	EQUIVALENCF (J,JS1)	14060
C		14070
7	K = 1	14080
8	IF(TT,LT,TMID)K = 2	14090
9	KK = 0	14100
10	CPSUM=0.	14110
11	90 IF(COEF(K,1,J),NE,0.)GO TO 97	14120
12	IF (IUSE(J),LT,0) GO TO 100	14130
C		14140
C	IF COEFFICIENTS ARE ZERO, USE OTHER TEMPERATURE INTERVAL	14150
C		14160
13	KK = K	14170
14	K = 1	14180
15	IF (KK.EQ.1) K = 2	14190
16	97 S(J) = (((COEF(K,5,J)/4.)*TT+ COEF(K,4,J)/3.)*TT+ COEF(K,3,J)/2.	14200
16	1)* TT+COEF(K,2,J))*TT+ COEF(K,1,J)*TLN + COEF(K,7,J)	14210
17	H0(J) = (((COEF(K,5,J)/5.)*TT+ COEF(K,4,J)/4.)*TT+ COEF(K,3,J)/3.	14220
17	1)*TT+ COEF(K,2,J)/2.)*TT+ COEF(K,1,J) + COEF(K,6,J)/TT	14230
18	CPSUM= CPSUM+(((COEF(K,5,J)*TT+ COEF(K,4,J))*TT+ COEF(K,3,J))*TT	14240
18	1 + COEF(K,2,J))*TT+ COEF(K,1,J))*EN(J,NPT).	14250
19	IF (KK.EQ.0) GO TO 100	14260
20	K = KK	14270
21	KK = 0	14280
22	100 IF(J.EQ.NS) GO TO 200	14290
23	J=J+1	14300
24	GO TO 90	14310
25	200 RETURN	14320
26	END	14330

SYMBOL	REFERENCES
90	11* 24
97	11 16*
100	12 19 22*
200	22 25*
A	300
AC	400
AM	400
ANUM	400
ATOM	400
B0	400
B0P	400
CALCH	500
COEF	208 300 11 16 17 18
CONVG	500
CPCVEQ	500
CPCVFR	500
* CPHS	12
CPSUM	400 10= 18=
CR	400
DATA	400
DELN	208 300
DENS	400
EN	208 300 18
ENLN	208 300
ENLSAV	400
ENN	400
ENNL	400
ENSAVE	400
ENTH	400
EQRAT	400
FAZ	400
FOX	400
FPCT	400
HP	500
HPP	400
HSUB0	400
H0	208 300 17=
IC	500
IMAT	500
* INDX	5*
IONS	500
IP	500
IUSAVE	500
IQ1	500
ISUB	500
ISUP	500
ISV	500
IT	500
ITM	500
ITNUM	500
IUSE	300 12
J	600 11 12 16 17 18 22 23=
JL10	500

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SUBROUTINE CPMS

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VMIN - 400
VOL - 500
VPLS - 400
WP - 400

```

1      SUBROUTINE MATRIX                                14340
      C
      C
2      DOUBLE PRECISION G,X                             14350
3      LOGICAL HP,SP,TP,INFBUG,CONVG,NEW,VL,UV,SV,TV,LOGV 14360
      C
      C THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR 14370
      C IBM 360 MACHINES ONLY                             14380
      C
4      DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS 14390
5      DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN          14400
6      DOUBLE PRECISION H,F,SS,TERM1,TERM,SSS           14410
      C
7      COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13) 14420
      1 ,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13) 14430
      2 ,VLM(13),TOTN(13)                                14440
8      COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115) 14450
      1 ,DELN(115),A(15,115),SUR(115,3),IUSE(115),TEMP(50,2),SLN(115)
9      COMMON/MISC/FNN,SUMN,TT,SO,ATOM(3,101),LLMT(15),H0(15),BOP(15,2) 14460
      1 ,TM,FLOW,THID,THIGH,PP,CPSUM,OF,EORAT,FPCT,R,PR,HSUBO,AC(2),AM(2)
      2 ,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)
      3 ,ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTMP(15),FOX(15),DFNS(15) 14470
      4 ,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV ,TRACF,SIZE
10     COMMON /DOUBLE/ G(20,21), X(20)                  14480
11     COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM
      1 ,NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEW,NSUM,NSUP,ITM,CPCVFR,CPCVEG 14490
      2 ,IUNS,NC,NSERT,JSOL,JLIO,KASE,NREAC,IC,JS1,VOL,SHOCK,IT,NFZ,CALCH
      3 ,IUSAVE,LSAVE,ISUP,ISUB,ITNUM                    14500
      C
12     EQUIVALENCE (NLM,L),(TP,TV),(SV,SP),(UV,HP),(CPCVEG,LOGV) 14510
      C
13     IQ2 = IQ1 + 1                                     14520
14     IQ3 = IQ2 + 1                                     14530
15     KMAT = IQ3                                         14540
16     IF (.NOT.CONVG.AND.TP) KMAT = IQ2                 14550
17     IMAT = KMAT - 1                                    14560
      C
      C CLEAR MATRIX STORAGES TO ZERO                    14570
      C
18     DO 211 I=1,IMAT                                    14580
19     DO 211 K=1,KMAT                                    14590
20     G(I,K)= 0.000                                      14600
21     211 CONTINUE                                       14610
22     G(IQ2,IQ1) = 0.                                    14620
23     SSS = 0.                                           14630
24     HSUM(NPT) = 0.                                     14640
      C
      C BEGIN SET UP OF ITERATION MATRIX                 14650
      C
25     KK = L                                              14660
26     DO 65 J=1,NS                                        14670
27     IF (IUSE(J),LT,0) GO TO 65                         14680
28     H=H0(J)*EN(J,NPT)                                  14690
29     IF (IUSE(J),GT,0) GO TO 70                         14700
30     F = (H0(J)-S(J)+ENLN(J)+TM)*FN(J,NPT)             14710

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31      SS = H-F                                14890
32      TERM1 = H                                14900
33      IF (KMAT.EQ. IQ2) TERM1 = F              14910
34      DO 55 I = 1, L                          14920
      C                                          14930
      C      CALCULATE THE ELEMENTS R(I,K)      14940
      C                                          14950
35      IF (A(I,J).EQ. 0.) GO TO 55              14960
36      TERM= A(I,J)*EN(J,NPT)                  14970
37      DO 15 K=1, L                            14980
38      G(I,K)= G(I,K) + A(K,J)*TERM            14990
39      15 CONTINUE                             15000
      C                                          15010
40      G(I,IQ1)=G(I,IQ1)+TERM                  15020
41      G(I,IQ2)=G(I,IQ2)+A(I,J)*TERM1          15030
42      IF (CONVG.OR.TP) GO TO 55               15040
43      G(I,IQ3)= G(I,IQ3)+A(I,J)*F            15050
44      IF (SP) G(IQ2,I) = G(IQ2,I) + A(I,J)*SS 15060
45      55 CONTINUE                             15070
46      IF (KMAT.EQ. IQ2) GO TO 64              15080
47      IF (CONVG.OR.HP) GO TO 59               15090
48      G(IQ2,IQ1) = G(IQ2,IQ1) + SS           15100
49      G(IQ2,IQ2)=G(IQ2,IQ2)+H0(J)*SS         15110
50      G(IQ2,IQ3) = G(IQ2,IQ3)+(S(J) - ENLN(J)-TM)*F 15120
51      GO TO 62                                15130
52      59 G(IQ2,IQ2)=G(IQ2,IQ2)+H0(J)*H         15140
53      IF (CONVG) GO TO 64                     15150
54      G(IQ2,IQ3)=G(IQ2,IQ3)+H0(J)*F          15160
55      62 G(IQ1,IQ3)=G(IQ1,IQ3)*F             15170
56      64 G(IQ1,IQ2)=G(IQ1,IQ2)+TERM1          15180
57      GO TO 65                                15190
      C                                          15200
      C      CONDENSED SPECIES                  15210
      C                                          15220
58      70 KK = KK + 1                          15230
59      DO 75 I = 1,L                          15240
60      G(I,KK) = A(I,J)                       15250
61      G(I,KMAT) = G(I,KMAT) - A(I,J)*EN(J,NPT) 15260
62      75 CONTINUE                             15270
63      G(KK,IQ2) = H0(J)                      15280
64      G(KK,KMAT) = H0(J) - S(J)              15290
65      HSUM(NPT) = HSUM(NPT) + H              15300
66      IF (.NOT.SP) GO TO 65                   15310
67      SSS = SSS + S(J)*EN(J,NPT)             15320
68      G(IQ2,KK) = S(J)                      15330
69      65 CONTINUE                             15340
70      SSS = SSS + G(IQ2,IQ1)                 15350
71      HSUM(NPT) = HSUM(NPT) + G(IQ1,IQ2)      15360
72      G(IQ1,IQ1) = SUMN - ENN                15370
      C                                          15380
      C      REFLECT SYMMETRIC PORTIONS OF THE MATRIX 15390
      C                                          15400
73      ISYM = IQ1                              15410
74      IF (HP.OR.CONVG) ISYM=IQ2              15420
75      DO 102 I=1,ISYM                        15430

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16      DO 102 J=1,ISYM                15440
17      G(J,I)=G(I,J)                  15450
18      102 CONTINUE                    15460
      C                                15470
      C      COMPLETE THE RIGHT HAND SIDE  15480
      C                                15490
19      IF(.NOT.CONVG) GO TO 140         15500
20      IF(.NOT.LOGV) GO TO 175         15510
      C                                15520
      C      LOGV = .TRUE.-- SFT UP MATRIX TO SOLVE FOR DLVPT 15530
      C                                15540
21      G(IQ1,IQ2) = FNN                15550
22      IQ = IQ1 - 1                    15560
23      DO 135 I = 1,IQ                15570
24      G(I,IQ2) = G(I,IQ1)            15580
25      135 CONTINUE                    15590
26      GO TO 175                       15600
27      140 DO 145 I=1,L               15610
28      X(I)=H0(I)-G(I,IQ1)            15620
29      G(I,KMAT) = G(I,KMAT)+X(I)      15630
30      145 CONTINUE                    15640
31      G(IQ1,KMAT) = G(IQ1,KMAT)+FNN-SUMN 15650
      C                                15660
      C      COMPLETE ENERGY ROW AND TEMPERATURE COLUMN 15670
      C                                15680
32      IF (KMAT.EQ. IQ2) GO TO 185     15690
33      IF (SPIENERGY = S0+ENN-SUMN - SSS 15700
34      IF (HP)ENERGY=HSUB0/TT - HSUM(NPT) 15710
35      G(IQ2,IQ3)=G(IQ2,IQ3) + ENERGY 15720
36      175 G(IQ2,IQ2)= G(IQ2,IQ2)+CPSUM 15730
37      185 IF(.NOT.VOL.OR.CONVG) GO TO 1000 15740
      C                                15750
      C      CONSTANT VOLUME MATRIX      15760
      C                                15770
38      IQ =IQ1-1                      15780
39      IF (KMAT.EQ. IQ2) GO TO 230     15790
40      DO 220 I=1,IQ                  15800
41      G(IQ1,I) = G(IQ2,I)-G(IQ1,I)   15810
42      G(I,IQ1) = G(I,IQ2)-G(I,IQ1)   15820
43      G(I,IQ2) = G(I,IQ3)            15830
44      220 CONTINUE                    15840
45      G(IQ1,IQ1) = G(IQ2,IQ2)-G(IQ1,IQ2)-G(IQ2,IQ1) 15850
46      G(IQ1,IQ2) = G(IQ2,IQ3)-G(IQ1,IQ3) 15860
47      IF (UV) G(IQ1,IQ2) = G(IQ1,IQ2) + ENN 15870
48      GO TO 260                       15880
49      230 DO 240 I=1,IQ               15890
50      G(I,IQ1) = G(I,IQ2)            15900
51      240 CONTINUE                    15910
52      260 KMAT = IMAT                 15920
53      IMAT = IMAT-1                   15930
54      1000 RETURN                      15940
55      ENO                             15950

```

SYMBOL	-----	REFERENCES	-----
15	-	3700 39*	
55	-	3400 35 42 45*	
59	-	47 52*	
62	-	51 55*	
64	-	46 53 56*	
65	-	2600 27 57 66 69*	
70	-	29 58*	
75	-	5900 62*	
102	-	7500 7600 78*	
135	-	8300 85*	
140	-	79 87*	
145	-	8700 90*	
175	-	80 86 96*	
185	-	92 97*	
211	-	1800 1900 21*	
220	-	10000 104*	
230	-	99 109*	
240	-	10900 111*	
260	-	108 112*	
1000	-	97 114*	
A	-	800 35 36 38 41 43 44 60 61	
AC	-	900	
AM	-	900	
ANUM	-	900	
ATOM	-	900	
B0	-	900 88	
B0P	-	900	
CALCH	-	1100	
COEF	-	500 800	
CONVG	-	3LG 1100 16 42 47 53 74 79 97	
CPCVEQ	-	1100 1200	
CPCVFR	-	1100	
CPR	-	400 700	
CPSUM	-	900 96	
CR	-	900	
DATA	-	900	
DELN	-	500 800	
DENS	-	900	
DLVPT	-	400 700	
DLVTP	-	400 700	
* DOUPLE	-	10*	
EN	-	500 800 28 30 36 61 67	
ENERGY	-	93= 94= 95	
ENLN	-	500 800 30 50	
ENLSAV	-	900	
ENN	-	900 72 81 91 93 107	
ENNLL	-	900	
ENSAVE	-	900	
ENTH	-	900	
EQRAT	-	900	
F	-	600 30= 31 33 43 50 54 55	
FAZ	-	900	
FOX	-	900	

I N D E X

SUBROUTINE MATRIX

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FPCT	-	9CO												
G	-	2DH	10CO	20=	27=	38=	40=	41=	43=	44=	48=	49=	50=	52=
		54=	55=	56=	60=	61=	63=	64=	68=	70	71	72=	77=	81=
		84=	88	89=	91=	95=	96=	101=	102=	103=	105=	106=	107=	110=
GAMMAS	-	4DH	7CO											
H	-	6DH	28=	31	32	52	65							
HP	-	3LG	11CO	12FO	47	74	94							
HPP	-	9CO												
HSUM	-	9CO	94											
HSUM	-	4DH	7CO	24=	65=	71=	94							
HQ	-	5DH	8CO	28	30	49	52	54	63	64				
I	-	1BD0	20	34D0	35	36	37D0	38	40	41	43	44	59D0	60
		61	75D0	76D0	77	83D0	84	87D0	88	89	100D0	101	102	103
		109D0	110											
IC	-	11CO												
IDEHUG	-	3LG												
IMAT	-	11CO	17=	18D0	112	113=								
INDX	-	11*												
IONS	-	11CO												
IP	-	11CO												
IQ	-	82=	83D0	98=	100D0	109D0								
IQSAVE	-	11CO												
IO1	-	11CO	13	22	40	48	55	56	70	71	72	73	81	82
		84	88	91	98	101	102	105	106	107	110			
IO2	-	13=	14	16	22	33	41	44	46	48	49	50	52	54
		56	63	68	70	71	74	81	84	92	95	96	99	101
		102	103	105	106	107	110							
IO3	-	14=	15	43	50	54	55	95	103	106				
ISUR	-	11CO												
ISUP	-	11CO												
ISV	-	11CO												
ISYM	-	73=	74=	75D0	76D0									
IT	-	11CO												
ITM	-	11CO												
ITHUM	-	11CO												
IUSF	-	8CO	27	29										
J	-	26D0	27	28	29	30	35	36	38	41	43	44	49	50
		52	54	60	61	63	64	67	68	76D0	77			
JLIQ	-	11CO												
JSOL	-	11CO												
JSI	-	11CO												
K	-	19D0	20	37D0	38									
KASF	-	11CO												
KK	-	25=	58=	60	63	64	68							
KMAT	-	11CO	15=	16=	17	19D0	33	46	61	64	89	91	92	99
		112=												
L	-	12EQ	25	34D0	37D0	59D0	87D0							
LLMT	-	9CO												
LOGV	-	3LG	12EQ	80										
LSAVE	-	11CO												
MATRIX	-	1*												
MISC	-	9*												
MOLFS	-	11CO												
NAME	-	9CO												
NC	-	11CO												

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SUBROUTINE MATRIX

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TIT	-	7CD		
TV	-	3LG	12EQ	
UV	-	3LG	12FQ	107
V	-	7CD		
VLM	-	7CD		
VMIN	-	9CD		
VOL	-	3LG	11CO	97
VPLS	-	9CD		
WM	-	7CD		
WP	-	9CD		
X	-	2DB	10CO	88= 89

1	C	SUBROUTINE GAUSS	15960
	C	SOLVE ANY LINEAR SET OF UP TO 20 EQUATIONS	15970
	C	NUMBER OF EQUATIONS = IMAT	15980
	C	DOUBLE PRECISION G,X,COEFX(20),SUM,Z	15990
2	C	COMMON/DOUBLE/G(20,21),X(20)	16000
3	C	COMMON/INDEX/ CONV G,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	16010
4	C	1, NS,KMAL,IMAT,101,NOE,NOMIT,IP,NEWB,NSUB,NSUP,ITM,CPCVFR,CPCVEO	16020
	C	2, IONS,NC,NSERT,JSOL,JLIQ,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	16030
	C	3, IQSAVE,LSAVE,ISUP,ISUB,ITNUM	300
5	C	DATA BIGNO/1.E+38/	16050
	C	BEGIN ELIMINATION OF NTH VARIABLE	16060
6	C	IUSE1 = IMAT+1	16070
7	C	DO 45 NN=1,IMAT	16080
8	C	IF (NN=IMAT) 8,83,8	16090
9	C	83 IF (G(NN,NN)) 31,23,31	16100
	C	SEARCH FOR MAXIMUM COEFFICIENT IN EACH ROW	16110
10	C	DO 18 I=NN,IMAT	16120
11	C	COEFX(I) = BIGNO	16130
12	C	IF (G(I,NN).EQ.0.) GO TO 18	16140
13	C	COEFX(I) = 0.	16150
14	C	DO 10 J=NN,IUSE1	16160
15	C	SUM = G(I,J)	16170
16	C	IF (SUM.LT.0.) SUM=-SUM	16180
17	C	IF (J.NE.NN) GO TO 9	16190
18	C	Z = SUM	16200
19	C	GO TO 10	16210
20	C	9 IF (SUM.GT.COEFX(I)) COEFX(I)=SUM	16220
21	C	10 CONTINUE	16230
22	C	COEFX(I) = COEFX(I)/Z	16240
23	C	18 CONTINUE	16250
	C	LOCATE ROW WITH SMALLEST MAXIMUM COEFFICIENT	16260
24	C	TEMP = BIGNO	16270
25	C	I=0	16280
26	C	DO 22 J=NN,IMAT	16290
27	C	IF (COEFX(J)-TEMP) 87,22,22	16300
28	C	87 TEMP=COEFX(J)	16310
29	C	I=J	16320
30	C	22 CONTINUE	16330
31	C	IF (I) 28,23,28	16340
	C	INDEX I LOCATES EQUATION TO BE USED FOR ELIMINATING THE NTH	16350
	C	VARIABLE FROM THE REMAINING EQUATIONS	16360
	C	INTERCHANGE EQUATIONS I AND NN	16370
	C		16380
	C		16390
	C		16400
	C		16410
	C		16420
	C		16430
	C		16440
	C		16450
	C		16460
	C		16470
	C		16480
	C		16490
	C		16500

```

32      28 IF(NN-I) 29,31,29      16510
33      29 DO 30 J=NN,IUSE1      16520
34      , Z=G(I,J)                16530
35      G(I,J)=G(NN,J)           16540
36      G(NN,J)=Z                16550
37      30 CONTINUE              16560
      C                          16570
      C      DIVIDE NTH ROW BY NTH DIAGONAL ELEMENT AND ELIMINATE THE NTH  16580
      C      VARIABLE FROM THE REMAINING EQUATIONS                      16590
      C                          16600
38      31 K = NN + 1            16610
39      DO 36 J = K, IUSE1        16620
40      IF(G(NN,NN).EQ.0.) GO TO 23 16630
41      G(NN,J) = G(NN,J) / G(NN,NN) 16640
42      36 CONTINUE              16650
43      IF(K-IUSE1) 88,45,88      16660
44      88 DO 44 I=K,IMAT         16670
45      DO 44 J = K, IUSE1        16680
46      G(I,J) = G(I,J) - G(I,NN)*G(NN,J) 16690
47      44 CONTINUE              16700
48      45 CONTINUE              16710
      C                          16720
      C      BACKSOLVE FOR THE VARIABLES                               16730
      C                          16740
49      K = IMAT                 16750
50      47 J = K + 1             16760
51      X(K) = 0.000             16770
52      SUM = 0.0                16780
53      IF(IMAT-J) 51,48,48      16790
54      DO 50 I=J,IMAT           16800
55      SUM = SUM + G(K,I)*X(I)   16810
56      50 CONTINUE              16820
57      X(K) = G(K,IUSE1) - SUM   16830
58      K = K - 1                16840
59      IF (K) 47,151,47         16850
60      23 IMAT = IMAT-1          16860
61      151 RETURN               16870
62      END                     16880

```

SYMBOL	-----	REFERENCES	-----
6	-	7*	
8	-	8	10*
9	-	17	20*
10	-	1400	19
18	-	1000	12
20	-	26*	21*
22	-	2600	27
23	-	9	31
28	-	31	32*
29	-	32	33*
30	-	3300	37*
31	-	9	32
36	-	3900	42*
40	-	45*	
44	-	4400	4500
45	-	700	43
47	-	50*	59
48	-	53	54*
50	-	5400	56*
51	-	53	57*
83	-	8	9*
87	-	27	28*
88	-	43	44*
151	-	59	61*
DIGNO	-	50A	11
CALCH	-	400	24
COEFK	-	208	11=
CONVG	-	400	13=
CPCVE0	-	400	20
CPCVFR	-	400	22=
DOUBLE	-	3*	27
G	-	208	28
GAUSS	-	1*	34
HP	-	400	35=
I	-	1000	36=
IC	-	400	40
IMAT	-	400	41=
INDX	-	4*	46=
IONS	-	400	55
IP	-	400	57
IQSAVE	-	400	
IQ1	-	400	
ISUB	-	400	
ISUP	-	400	
ISV	-	400	
IT	-	400	
ITM	-	400	
ITNUM	-	400	
IUSE1	-	6=	
J	-	1400	15
JL10	-	4500	46

I N D E X

SUBROUTINE GAUSS

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JSOL	-	4C0												
JS1	-	4C0												
K	-	38=	3900	43	4400	4500	49=	50	51	55	57	58=	59	
KASE	-	4C0												
KMAT	-	4C0												
LSAVE	-	4C0												
MOLES	-	4C0												
NC	-	4C0												
NEWNR	-	4C0												
NFZ	-	4C0												
NLM	-	4C0												
NN	-	700	8	9	1000	12	1400	17	2600	32	3300	35	36	38
	-	40	41	46										
NOI	-	4C0												
NOMIT	-	4C0												
NP	-	4C0												
NPP	-	4C0												
NPT	-	4C0												
NREAC	-	4C0												
NS	-	4C0												
NSERT	-	4C0												
NSUR	-	4C0												
NSUP	-	4C0												
NT	-	4C0												
* RETURN	-	61*												
SHOCK	-	4C0												
SP	-	4C0												
SUM	-	20B	15=	16	18	20	52=	55=	57					
TEMP	-	24=	27	28=										
TP	-	4C0												
VOL	-	4C0												
X	-	20B	3C0	51=	55	57=								
Z	-	20B	18=	22	34=	36								

1		SUBROUTINE OUT1	16890
2	C	DOUBLE PRECISION G,X	16900
	C		16910
	C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	16920
	C	IBM 360 MACHINES ONLY	16930
	C		16940
3		DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS	16950
4		DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN	16960
	C		16970
5		LOGICAL EQL,FROZ,TP,HP,SP,HPSP,TPSP,MOLES,VOL	16980
	C		16990
6		DIMENSION NV(13),Z(10,3),HEAD(15),YX(5),YH(5),FSB(3),FRHO(3)	17000
	C		17010
7		COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13)	17020
		1 ,GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),TTT(13)	17030
		2 ,VLM(13),TOTN(13)	17040
8		COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	17050
		1 ,DELN(115),A(15,115),SUR(115,3),IUSE(115),TEMP(50,2),SLN(115)	
9		COMMON/MISC/ENN,SUMN,TT,S0,ATOM(3,101),LLNT(15),R0(15),R0P(15,2)	17060
		1 ,TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUB0,AC(2),AM(2)	17070
		2 ,HPP(2),RH(2), VMTN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	17080
		3 ,ANUM(15,5),PECWT(15),ENTH(15),FAZ(15),RTEMP(15),FOX(15),DENS(15)	17100
		4 ,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV ,TRACE,SIZE	17110
10		COMMON /DOUBLE/ G(20,21), X(20)	
11		COMMON/INDEX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	17130
		1 ,NS,KMAT,IMAT,I01,NOF,NOMIT,IP,NEWR,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	300
		2 ,IONS,NC,INSERT,JSOL,JLIO,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	17150
		3 ,ISAVE,LSAVE,ISUP,ISUB,ITNUM	17160
12		COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VACI(13),SUBAR(13),SUPAR(13)	17170
		1 ,APP(13),AEAT(13),CSTR,EQL,FROZ,SS0,AREA,AWT	17180
13		COMMON/OUTP/FMT(30),FP(4),FT(4),FH(4),FS(4),FM(4),FV(4),FD(4)	17190
		1 ,FC(4),FG(4),FB,FMT13,F1,F2,F3,F4,F5,FL(4),FMT19,FA1,FA2	17200
		2 ,FR1,FC1,FN(4),FR(4),FA(4),FI(4),FMT9X,F0	17210
	C		17220
14		EQUIVALENCE (V,NV),(7,H0),(18,FB)	17230
	C		17240
	C	HEAD=(1H ,2A4,5 (A2,FB,5,3X),5 X,F7.5,F13.3,4X,A1,F10.2,F9,4)	17250
	C		17260
15		DATA HEAD/4H(1H ,4H,2A4,2H,5,4H(A2,,4HF8.5 ,4H,3X),2H,5 ,2HX,	17270
		1 ,4HF7.5 ,4H,F13 ,4H,3,4 ,4HX,A1 ,4H,F10 ,4H,2,F ,4H,9,4)/	17280
16		DATA FUEL/4HFUEL/,OXID/4HOXID/,ANT/3HANT/,OX/1HO/,IZ/2H00/	17290
		1 ,YN/2H,1, 2H,2, 2H,3, 2H,4, 2H,5 /,F75/4HF7.5/	17300
		2 ,YX/3H,57,3H,44,3H,31,3H,18,2H,5 /,F73/4HF7.3/	17310
17		DATA FRHO/4HFRHO,,4H G/C,1HC/	17320
	C		17330
18		IF(KASE.NE.0) WRITE(6,3) KASE	17340
19		3 FORMAT (9H CASE NO. ,I8)	17350
20		IF(.NOT.MOLES) WRITE(6,5)	17360
21		5 FORMAT (77X,46HWT FRACTION ENERGY STATE TEMP DENSITY/	17370
		1 10X,16HCHEMICAL FORMULA,51X,21H(SEE NOTE) CAL/MOL,10X,5HDEG K,	17380
		2 4X,4HG/CC)	17390
22		IF(MOLES) WRITE(6,6)	17400
23		6 FORMAT (79X,5HMOLES,7X, 33H ENERGY STATE TEMP DENSITY/	17410
		1 10X,16HCHEMICAL FORMULA,66X,7HCAL/MOL,10X,13HDFG K G/CC)	17420
			17430

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I N D E X

SUBROUTINE OUT1

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24      DO 15 N=1,NREAC                      17440
25      IF (FOX(N).NE.OX) GO TO 10           17450
26      HD1 = OXID                          17460
27      HD2 = ANT                          17470
28      GO TO 11                          17480
29      10 HD1 = FUEL                      17490
30      HD2 = FB                          17500
31      11 DO 13 J=1,5                      17510
32      IF (NAMF(N,J).EQ.IZ.OR.NAME(N,J).EQ.IB) GO TO 14 17520
33      13 CONTINUE                      17530
34      J=6                              17540
35      14 J=J-1                          17550
36      HEAD(3)=YN(J)                    17560
37      HEAD(7)=YX(J)                    17570
38      HEAD(9) = F75                     17580
39      IF (PECWT(N).GE.10.) HEAD(9)=F73  17590
40      WRITE(6,HEAD)HD1,HD2,(NAME(N,JJ),ANUM(N,JJ),JJ=1,J),PECWT(N),ENTH(
1N), FAZ(N),RTEMP(N),DENS(N)          17600
41      15 CONTINUE                      17620
42      FPC = 100./(1.+OF)                17630
43      WRITE(6,20) OF ,FPC,EQRAT,RHOP    17640
44      20 FORMAT (1H0,15X, 4H0/F=, F8.4,4X,13HPERCENT FUEL=,F8.4,4X,
1 19HEQUIVALENCE RATIO= ,F7.4,4X,17HREACTANT DENSITY=,F8.4//) 17650
C                                         17660
45      AGV = 9.80665                     17670
46      RETURN                            17680
C                                         17690
47      ENTRY OUT2                        17700
48      FMT(4) = FMT(5)                  17710
C                                         17720
C      PRESSURE                          17730
C                                         17740
C                                         17750
49      50 IF (R.LT.10.) GO TO 60         17760
50      CALL EFMT(NPT,FP,PPP)             17770
51      GO TO 64                          17780
52      60 CALL VARFMT (PPP,NPT)          17790
53      WRITE (6,FMT) (FP(I),I=1,4),(PPP(J),J=1,NPT) 17800
C                                         17810
C      TEMPERATURE                      17820
C                                         17830
54      64 DO 65 I=1,NPT                  17840
55      NV(I) = YTT(I)+.5                 17850
56      65 CONTINUE                      17860
57      FMT(4)=FMT13                      17870
58      FMT(5)=FMT19                      17880
59      WRITE (6,FMT) (FY(I),I=1,4),(NV(J),J=1,NPT) 17890
C                                         17900
C      DENSITY                          17910
C                                         17920
60      DO 70 I=1,NPT                    17930
61      IF (VLM(I).NE.0.) V(I)=1./VLM(I)  17940
62      70 CONTINUE                      17950
63      CALL EFMT(NPT,FRHO,V)            17960
C                                         17970
C      ENTHALPY                        17980

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64	C	DO 75 I=1,NPT	17990
65		V(I) = HSUM(I) * R	18000
66	75	CONTINUE	18010
67		FM(5) = F8	18020
68		IF(R.LT.10.) GO TO 76	18030
69		CALL EFMT(NPT,FH,V)	18040
70		FM(7) = F1	18050
71		GO TO 77	18060
72	76	FM(7) = F1	18070
73		WRITE (6,FM) (FH(I),I=1,4), (V(J),J=1,NPT)	18080
	C		18090
	C	ENTROPY	18100
	C		18110
	C		18120
74		FM(7) = F4	18130
75	77	DO 78 I=1,NPT	18140
76		V(I) = SSUM(I) * R	18150
77	78	CONTINUE	18160
78		WRITE (6,FM) (FS(I),I=1,4), (V(J),J=1,NPT)	18170
79		WRITE (6,80)	18180
80	80	FORMAT (11H)	18190
	C		18200
	C	MOLECULAR WEIGHT	18210
	C		18220
81		FM(7) = F3	18230
82		WRITE (6,FM) (FM(I),I=1,4), (WM(J),J=1,NPT)	18240
	C		18250
	C	(DLV/DLP)T	18260
	C		18270
83		FM(7) = F5	18280
84		IF (EQL) WRITE (6,FM) (FV(I),I=1,4), (DLVPT(J),J=1,NPT)	18290
	C		18300
	C	(DLV/DLT)P	18310
	C		18320
85		FM(7) = F4	18330
86		IF (EQL) WRITE (6,FM) (FO(I),I=1,4), (DLVTP(J),J=1,NPT)	18340
	C		18350
	C	HEAT CAPACITY	18360
	C		18370
87		IF (R.GT.10.) FM(7) = F1	18380
88		DO 85 I=1,NPT	18390
89		V(I) = CPR(I) * R	18400
90	85	CONTINUE	18410
91		WRITE (6,FM) (FC(I),I=1,4), (V(J),J=1,NPT)	18420
	C		18430
	C	GAMMA(S)	18440
	C		18450
92		FM(7) = F4	18460
93		WRITE (6,FM) (FG(I),I=1,4), (GAMMAS(J),J=1,NPT)	18470
	C		18480
	C	SONIC VELOCITY	18490
	C		18500
94		FM(7) = F1	18510
95		DO 95 I = 1,NPT	18520
96		SONVEL(I) = (RR * GAMMAS(I) * TTT(I) / WM(I)) **.5	18530

97	95 CONTINUE	18540
98	WRITE(6,FMT) (FL(I),I=1,4), (SONVEL(J),J=1,NPT)	18550
99	RETURN	18560
	C	18570
100	ENTRY OUT3	18580
	C	18590
101	TRA = 5.E-6	18600
102	IF (TRACE.NE.0.) TRA= TRACE	18610
103	IF (.NOT.EQL) GO TO 331	18620
	C	18630
	C MOLE FRACTIONS = EQUILIBRIUM	18640
	C	18650
104	WRITE (6,80)	18660
105	FMT(7)= F5	18670
106	WRITE(6,310)	18680
107	310 FORMAT(15HMOLE FRACTIONS //)	18690
108	DO 330 K=1,NS	18700
109	DO 315 I=1,NPT	18710
110	V(I) = EN(K,I)/TOTN(I)	18720
111	315 CONTINUE	18730
112	DO 316 I=1,NPT	18740
113	IF (TRACE.EQ.0.) GO TO 317	18750
114	IF (V(I).GE.TRACE) GO TO 325	18760
115	317 IF (V(I).GE.(5.F-6)) GO TO 320	18770
116	316 CONTINUE	18780
117	GO TO 330	18790
118	320 WRITE (6,FMT) SUB(K,1),SUB(K,2),SUB(K,3),FB.(V(I),I=1,NPT)	18800
119	GO TO 330	18810
120	325 FSB(1) = SUB(K,1)	18820
121	FSB(2) = SUB(K,2)	18830
122	FSB(3) = SUB(K,3)	18840
123	CALL EFMT(NPT,FSB,V)	18850
124	330 CONTINUE	18860
125	331 WRITE(6,335) TRA	18870
126	335 FORMAT(83H0ADDITIONAL PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOL IE FRACTIONS WERE LESS THAN .E12.5+28H FOR ALL ASSIGNED CONDITIONS/ 2/)	18880 18890 18900
127	LINE=0	18910
128	NN = 1	18920
129	IF (EQL) NN=NPT	18930
130	DO 350 K=1,NS	18940
131	DO 340 I=1,NN	18950
132	IF ((EN(K,I)/TOTN(I)).GE.TRA) GO TO 343	18960
133	340 CONTINUE	18970
134	LINE= LINE+1	18980
135	Z(LINE,1)= SUB(K,1)	18990
136	Z(LINE,2)= SUB(K,2)	19000
137	Z(LINE,3)= SUB(K,3)	19010
138	343 IF ((LINE.NE.10) .AND. K.NE.NS) GO TO 350	19020
139	IF (LINE.EQ.0) GO TO 1000	19030
140	WRITE(6,345) (Z(LN,1),Z(LN,2),Z(LN,3),LN=1,LINE)	19040
141	345 FORMAT (10(1X,3A4))	19050
142	LINE=0	19060
143	350 CONTINUE	19070
144	IF (.NOT.MOLES) WRITE(6,360)	19080

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145	360 FORMAT(78H0NOTE, WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXI	19090
	2DANT IN TOTAL OXIDANTS)	19100
146	1000 RETURN	19110
147	END	19120

SYMBOL	-----	REFERENCES	-----
J	- 18WR	19*	
5	- 20WR	21*	
6	- 22WR	23*	
10	- 25	29*	
11	- 28	31*	
13	- 31DO	33*	
14	- 32	35*	
15	- 24DO	41*	
20	- 43WR	44*	
50	- 49*		
60	- 49	52*	
64	- 51	54*	
65	- 54DO	56*	
70	- 60DO	62*	
75	- 64DO	66*	
76	- 68	72*	
77	- 71	75*	
78	- 75DO	77*	
80	- 79WR	80*	104WR
85	- 88DO	90*	
95	- 95DO	97*	
310	- 106WR	107*	
315	- 109DO	111*	
316	- 112DO	116*	
317	- 113	115*	
320	- 115	118*	
325	- 114	120*	
330	- 108DO	117	119 124*
331	- 103	125*	
335	- 125WR	126*	
340	- 131DO	133*	
343	- 132	138*	
345	- 140WR	141*	
350	- 130DO	138	143*
360	- 144WR	145*	
1000	- 139	146*	
A	- 8CO		
AC	- 9CO		
AEAT	- 12CO		
AGV	- 45=		
AM	- 9CO		
ANT	- 16DA	27	
ANUM	- 9CO	40WR	
APP	- 12CO		
AREA	- 12CO		
ATOM	- 9CO		
AWT	- 12CO		
B0	- 9CO		
B0P	- 9CO		
CALCH	- 11CO		
COEF	- 4DB	8CO	
CONVG	- 11CO		
CPCVEQ	- 11CO		

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F2	-	13C0																	
F3	-	13C0	81																
F4	-	13C0	74	85	92														
F5	-	13C0	83	105															
F73	-	16DA	39																
F75	-	16DA	38																
G	-	20B	10C0																
GAMMAS	-	30B	7C0	93WR	96														
HD1	-	26=	29=	40WR															
HD2	-	27=	30=	40WR															
HEAD	-	60I	15DA	36=	37=	38=	39=	40WR											
HP	-	5LG	11C0																
HPP	-	9C0																	
HPSP	-	5LG																	
HSUB0	-	9C0																	
HSUM	-	3DB	7C0	65															
H0	-	4DB	8C0	14EQ															
THE VARIABLE- I -IS USED BEFORE IT IS DEFINED																			
I	-	53WR	54D0	55	59WR	60D0	61	64D0	65	73WR	75D0	76	78WR	82WR					
	-	84WR	86WR	88D0	89	91WR	93WR	95D0	96	98WR	109D0	110	112D0	114					
	-	115	118WR	131D0	132														
IB	-	14EQ	32																
IC	-	11C0																	
IMAT	-	11C0																	
INDX	-	11*																	
I0NS	-	11C0																	
IP	-	11C0																	
I0SAVE	-	11C0																	
I01	-	11C0																	
ISUH	-	11C0																	
ISUP	-	11C0																	
ISV	-	11C0																	
IT	-	11C0																	
ITM	-	11C0																	
ITNUM	-	11C0																	
IUSE	-	8C0																	
I2	-	16DA	32																
J	-	31D0	32	34=	35=	36	37	40WR	53WR	59WR	73WR	78WR	82WR	84WR					
	-	86WR	91WR	93WR	98WR														
THE VARIABLE- JJ -IS USED BEFORE IT IS DEFINED																			
JJ	-	40WR																	
JL10	-	11C0																	
JSOL	-	11C0																	
JS1	-	11C0																	
K	-	108D0	110	118WR	120	121	122	130D0	132	135	136	137	138						
KASE	-	11C0	18																
KMAT	-	11C0																	
LINF	-	127=	134=	135	136	137	138	139	140WR	142=									
LLMT	-	9C0																	
THE VARIABLE- LN -IS USED BEFORE IT IS DEFINED																			
LN	-	140WR																	
LSAVE	-	11C0																	
MISC	-	98																	
MOLES	-	5LG	11C0	20	22	144													
N	-	24D0	25	32	39	40WR													

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[illegible]

1		SUBROUTINE VARFMT(V,NPT)	19130
	C		19140
2		DIMENSION V(13)	19150
	C		19160
3		COMMON/OUPT/FMT(30),FP(4),FT(4),FH(4),FS(4),FM(4),FV(4),FO(4)	19170
		1 ,FC(4),FG(4),FB,FMT13,F1,F2,F3,F4,F5,FL(4),FMT19,FA1,FA2	19180
		2 ,FR1,FC1,FN(4),FR(4),FA(4),FI(4),FMT9X,F0	19190
	C		19200
4		DO 45 I=1,NPT	19210
5		K= 2*I+3	19220
6		FMT(K) = F4	19230
7		IF (V(I).GE.10.) FMT(K) = F3	19240
8		IF (V(I).GE.100.) FMT(K) = F2	19250
9		IF (V(I).GE.10000.) FMT(K) = F1	19260
10		IF (V(I).GE.1000000.) FMT(K) = F0	19270
11		45 CONTINUE	19280
12		RETURN	19290
13		END	19300

SYMBOL		REFERENCES				
45	-	400	11*			
FA	-	300				
FA1	-	300				
FA2	-	300				
FB	-	300				
FC	-	300				
FC1	-	300				
FD	-	300				
FG	-	300				
FH	-	300				
FI	-	300				
FL	-	300				
FM	-	300				
FMT	-	300	6=	7=	8=	9= 10=
FMTI9	-	300				
FMT13	-	300				
FMT9X	-	300				
FN	-	300				
FP	-	300				
FR	-	300				
FR1	-	300				
FS	-	300				
FT	-	300				
FV	-	300				
F0	-	300	10			
F1	-	300	9			
F2	-	300	8			
F3	-	300	7			
F4	-	300	6			
F5	-	300				
I	-	400	5	7	8	9 10
K	-	5=	6	7	8	9 10
NPT	-	1AG	400			
* OUPY	-	3*				
* RETURN	-	12*				
V	-	1AG	2DI	7	8	9 10
* VARFMT	-	1*				

1		SUBROUTINE EFMT(NPT,AA,V)	19310
	C		19320
2		DIMENSION AA(3), V(13), W(13), NE(13), FRMT(7)	19330
	C		19340
3		COMMON/DUPT/FMT(30),FP(4),FT(4),FH(4),FS(4),FM(4),FV(4),FD(4)	19350
		1,FC(4),FG(4),FB,FMT13,F1,F2,F3,F4,F5,FL(4),FMT19,FA1,FA2	19360
		2,FR1,FC1,FN(4),FR(4),FA(4),FI(4),FMT9X,F0	19370
	C		19380
4		DATA FRMT/3H(1H,4H,3A4,4H,11X,4H,13(,4HF7,4,4H,I2),1H)/,F63/4HF6.3	19390
		1/,FI3/4H,I3)/,F74/4HF7,4/,FI2/4H,I2)/,F11X/4H,11X/,F2X/3H,2X/	19400
	C		19410
5		FRMT(5) = F74	19420
6		FRMT(6) = FI2	19430
7		J1 = 1	19440
8		FRMT(3) = F2X	19450
9		IF(FMT(4),NE,FMT9X) GO TO 130	19460
10		J1 = 2	19470
11		FRMT(3) = F11X	19480
12	130	DO 145 I=J1,NPT	19490
13		IF(V(I),NE,0.) GO TO 140	19500
14		W(I) = 0.	19510
15		NE(I) = 0.	19520
16		GO TO 145	19530
17	140	EE = ALOG10(ABS(V(I)))	19540
18		NE(I) = EE	19550
19		FE = NE(I)	19560
20		IF(EE.LE.0.,.AND.,FE,NE,EE) NE(I)=NE(I)-1	19570
21		IF(IABS(NE(I)).LT.10) GO TO 144	19580
22		FRMT(5) = F63	19590
23		FRMT(6) = FI3	19600
24	144	W(I) = V(I)/10.*NE(I)	19610
25	145	CONTINUE	19620
26		WRITE(6,FRMT) (AA(I),I=1,3),(W(J), NE(J),J=J1,NPT)	19630
27	1000	RETURN	19640
28		END	19650

SYMBOL	REFERENCES
130	9 12*
140	13 17*
144	21 24*
145	1200 16 25*
1000	27*
AA	1A6 20I 26WR
* ABS	17
* ALOG10	17
EE	17= 18 20
* EFMT	1*
FA	3C0
FA1	3C0
FA2	3C0
FB	3C0
FC	3C0
FC1	3C0
FD	3C0
FE	19= 20
FG	3C0
FH	3C0
FI	3C0
FI2	4DA 6
FI3	4DA 23
FL	3C0
FM	3C0
FMT	3C0 9
FMTI9	3C0
FMTI3	3C0
FMT9X	3C0 9
FN	3C0
FP	3C0
FR	3C0
FRMT	2DI 4DA 5= 6= 8= 11= 22= 23= 26WR
FR1	3C0
FS	3C0
FT	3C0
FV	3C0
FO	3C0
F1	3C0
F11X	4DA 11
F2	3C0
F2X	4DA 8
F3	3C0
F4	3C0
F5	3C0
F63	4DA 22
F74	4DA 5
I	1200 13 14 15 17 18 19 20 21 24 26WR
* IABS	21
THE VARIABLE- J -IS USED BEFORE IT IS DEFINED	
J	26WR
J1	7= 10= 1200 26WR
NE	2DI 15= 18= 19 20= 21 24 26WR

I N D E X

SUBROUTINE EFMT(NPT,AA,V)

PAGE 202

NPT	-	1AG	1200	26WR		
OUT	-	3*				
RETURN	-	27*				
V	-	1AG	20I	13	17	24
W	-	20I	14=	24=	26WR	

1	SUBROUTINE RCKET	20760
C		20770
C	ROCKET PERFORMANCE	20780
2	DOUBLE PRECISION USQ,ASQ	20790
C		20800
C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	20810
C	IBM 360 MACHINES ONLY	20820
C		20830
3	DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS	20840
4	DOUBLE PRECISION COFF,S,FN,ENLN,H0,DELN	20850
C		20860
C		20870
5	LOGICAL HP,SP,TP,THI,FROZ,FOL,AREA,SEQL,CALCH,TCFST,ERR	20880
C		20890
C		20900
6	COMMON/HLK001/IRKT01,IRKT02,ERR,IN	
7	COMMON/HLK002/ SILOPT(18),SILVAC(18),ACSTRT(18),APEXT(18)	
8	COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13)	20910
1	GAMMAS(13),P(26),T(26),V(13),PPP(13),WM(13),SONVEL(13),YTT(13)	20920
2	VLM(13),TOTN(13)	20930
9	COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	
1	DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)	
10	COMMON/MISC/FNN,SUMN,TT,SO,ATOM(3,101),LLMT(15),BO(15),ROP(15,2)	20960
1	TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUR0,AC(2),AM(2)	20970
2	HPP(2),RHO(2),VMTN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	20980
3	ANUM(15,5),PFCWT(15),ENTH(15),FAZ(15),RTMP(15),FOX(15),DENS(15)	20990
4	RROP,RMH(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACE,SIZE	
11	COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NRT,NLM	
1	NS,KMAT,IMAT,IQ1,NOF,NOMIT,IP,NEWNR,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	21020
2	IONS,NC,NSERT,JSOL,JLID,KASE,NREAC,IC,JSI,VOL,SHOCK,IT,NFZ,CALCH	21030
3	IQSAVE,LSAVE,ISUP,ISUB,ITNUM	21040
12	COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VACI(13),SUBAR(13),SUPAR(13)	21050
1	APP(13),AEAT(13),CSTR,EQL,FROZ,SSO,AREA,AWT	21060
C		21070
13	DATA AVG/9.80665/	
14	TCST = .FALSE,	21090
15	ITM = 1	21100
16	NFZ = 1	21110
17	APP(1) = 1.	21120
18	EQL = .TRUE.	21170
19	NPP = 0	21200
20	DO 305 I=1,27	21210
21	IF(PCP(I).EQ.0.) GO TO 306	21220
22	NPP = I	21230
23	305 CONTINUE	21240
24	306 NPP = NPP+2	21250
25	311 NSUB = 0	21260
26	NSUP = 0	21270
27	DO 320 I=1,13	21280
28	IF(SUBAR(I).NE.0.) NSUB=NSUB+1	21290
29	IF(SUPAR(I).NE.0.) NSUP=NSUP+1	21300
30	320 CONTINUE	21310
31	SEQL = EQL	21330
32	IOF = 0	21340
33	IT = 3400.	

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C      LOOP FOR EACH O/F      21360
C      21370
C      21380
C      21390
34      321 IT = 1      21400
35      IOF = IOF + 1      21410
36      OF = OXF(IOF)      21420
37      CALL NEWOF      21430
38      IF(CALCH.AND.TT.EQ.0.) RETURN      21440
39      IF(T(1).EQ.0.) GO TO 322      21450
40      TT = T(1)      21460
C      21470
C      LOOP FOR CHAMBER PRESSURES      21480
C      322 DO 998 IP = 1,NP      21490
41      ITNUM = 0      21500
42      AREA = .FALSE.      21510
43      IF(T(1).EQ.0..OR.TCEST) HP=.TRUE.      21520
44      IF(T(1).NE.0..AND..NOT.TCEST) TP=.TRUE.      21530
45      SP = .FALSE.      21540
46      EQL = .TRUE.      21550
47      ISUB = 1      21560
48      ISUP = 1      21570
49      PP = P(IP)      21580
50      IPP = 1      21590
51      C      21600
C      LOOP FOR PRESSURE RATIOS      21610
C      21620
C      331 CALL EQLBRM      21630
C      21640
C      TT = 0 IF NO CONVERGENCE      21650
C      21660
C      1332 IF(TT.NE.0.) GO TO 333      21670
53      IF(NPT.LT.1) GO TO 1000      21680
54      GO TO 900      21690
55      333 IF(IPP.GT.1) GO TO 195      21700
56      C      21710
C      COMBUSTION CHAMBER      21720
C      21730
C      21740
C      21750
57      EQL = SEQL      21760
58      TP = .FALSE.      21770
59      HP = .FALSE.      21780
60      SP = .TRUE.      21790
61      SO = SSUM(1)      21800
62      CPRE = CPSUM      21810
63      334 TMELT=0.      21820
64      ITROT = 3      21830
65      THI = .FALSE.      21840
66      APP(2) = ((GAMMAS(1)+1.)/2.)*GAMMAS(1)/(GAMMAS(1)-1.)      21850
67      PP = PPP(1)/APP(2)      21860
68      TT = 2.*T/(GAMMAS(1)+1.)      21870
69      ISV = 1      21880
70      GO TO 870      21890
71      195 USQ = 2.*(HSUM(1)-HSUM(NPT)) * RR      21900
72      IF(IPP.GT.2) GO TO 900      21910
C      21920
C      THROAT      21930

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73      C
74      190 IF(.NOT.TH1) GO TO 191
75      GAMMAS(2) = 0.
76      GO TO 899
77      191 ASQ = GAMMAS(2)*TT*ENN*RR
78      DH = (USQ-ASQ)/ASQ
79      IF(DH.LT.0.) DH=-DH
80      IF(DH.LE.0.4E-4.OR.ITROT.EQ.0) GO TO 899
81      IF(JSOL.NE.0) GO TO 925
82      IF(TMELT.EQ.0.) GO TO 192
83      DLT = ALOG(TMELT/TT)
84      DD = DLT*CPR(2)/(ENN*DLVTP(2))
85      PP = PP*EXP(DD)
86      APP(2) = P(IP)/PP
87      TH1 = .TRUE.
88      GO TO 331
89      925 TMELT = TT
90      192 APP(2) = APP(2)/(1.+(USQ-ASQ)/(ENN*TT*RR*(GAMMAS(2)+1.)))
91      193 PP = P(IP)/APP(2)
92      ITROT = ITROT-1
93      GO TO 331
94      899 AWT = ENN*TT/(PP*USQ**.5)
95      PCPLT = ALOG(APP(2))
96      C
97      900 ISV = 0
98      AEAT(NPT) = ENN*TT(NPT)/(PP*USQ**.5*AWT)
99      IF(TT.EQ.0.) GO TO 860
100     IF(AREA) GO TO 800
101     IF(IPP.LT.NPP) GO TO 859
102     IF(NSUR.EQ.0.AND.NSUP.EQ.0) GO TO 860
103     AREA = .TRUE.
104     C
105     PCP ESTIMATES FOR AREA RATIOS
106     C
107     800 IF(ITNUM.NE.0) GO TO 810
108     DLNP = 1.
109     ITNUM = 1
110     ARATIO = SUBAR(ISUR)
111     IF(NSUB.LE.0) ARATIO=SUPAR(ISUP)
112     ELN = ALOG(ARATIO)
113     IF(NSUR.LE.0) GO TO 799
114     APPL = PCPLT/(SUPAR(ISUR)*(10.587*ELN**2+9.454)*ELN)
115     IF(ARATIO.LT.1.09) APPL=.9*APPL
116     IF(ARATIO.GT.10.) APPL = APPL/ARATIO
117     GO TO 859
118     799 IF(SUPAR(ISUP).LT.2.) GO TO 805
119     IF(ISUP.GT.1.AND.SUPAR(ISUP-1).GE.2.) GO TO 802
120     APPL = GAMMAS(2)+ELN*1.4
121     GO TO 859
122     805 APPL = SQRT(ELN*(1.535+3.294*ELN))*PCPLT
123     GO TO 859
124     C
125     TEST FOR CONVERGENCE ON AREA RATIO.
126     C

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119      R10 CHECK = ,00004
120      809 IF (ABS(AEAT(NPT) - ARATIO) / ARATIO . . LE .CHECK) GO TO 830
121      DELTAE = (AEAT(NPT) - ARATIO) / ARATIO
122      IF (ABS(DLNPE) .LT. ,00004) GO TO 830
123      AEATL = AL0G(AEAT(NPT))
124      ITNUM = ITNUM + 1
125      IF (ITNUM .GT. 10) GO TO 840
      C
      C      IMPROVED PCP ESTIMATES.
      C
126      ASQ = GAMMAS(NPT) * ENN * RR * TT
127      DLNPE = GAMMAS(NPT) * USO / (USQ - ASQ)
128      802 DLNP = DLNPE * ELN - DLNPE * AEATL
129      APPL = APPL + DLNP
130      IF (ITNUM .EQ. 1) GO TO 859
131      IF (APPL .LT. 0.) APPL = ,000001
132      APP(NPT) = EXP(APPL)
133      PP = P(1P) / APP(NPT)
134      GO TO 331
      C
135      830 ITNUM = 0
136      AEAT(NPT) = ARATIO
137      IF (NSUR .LE. 0) GO TO 834
138      ISUB = ISUR + 1
139      IF (ISUB .LE. NSUB) GO TO 800
140      ISUB = 1
141      NSUB = -NSUB
142      IF (ISUP .LE. NSUP) GO TO 800
143      GO TO 835
144      834 ISUP = ISUP + 1
145      IF (ISUP .LE. NSUP) GO TO 800
146      ISUP = 1
147      835 AREA = ,FALSE.
148      GO TO 860
149      840 WRITE(6,841) ARATIO
150      841 FORMAT(34H010 NOT CONVERGE FOR AREA RATIO =,F10.5)
151      GO TO 830
      C
      C      TEST FOR OUTPUT -- END OF PCP, SURAR, AND SUPAR SCHEDULES OR NPT=13.
      C
152      859 ISV = NPT
153      IF (NPT .NE. 13) GO TO 870
154      860 IF (EQL) GO TO 861
155      CPR(1) = CPRF
156      GAMMAS(1) = CPRF / (CPRF - 1. / WM(1))
157      861 CONTINUE
158      SL2 = (2. * RR * (HSUM(1) - HSUM(2))) * ,5 / AVG
159      AW2 = RR * TTT(2) / (PPP(2) * WM(2) * SL2 * AVG * ,2)
160      CSTAR = (2. * (1.74 * PPP(1) * AW2
161      DO 8611 I = 3, NPT
162      IF (IRKT02 .GT. 18) GO TO 8612
163      SILOPT(IRKT02) = (2. * RR * (HSUM(1) - HSUM(I))) * ,5 / AVG
164      AW = RR * TTT(I) / (PPP(I) * WM(I) * SILOPT(IRKT02) * AVG * ,2)
165      ACSTAR(IRKT02) = CSTAR
166      SILVAC(IRKT02) = SILOPT(IRKT02) * PPP(I) * AW

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167      APFXT(IRKT02)=PPP(I)*14.696
168      IRKT02 = IRKT02 + 1
169      R611 CONTINUE
170      GO TO R622
171      R612 WRITE(6,8613)
172      R613 FORMAT('ON0. OF REQUESTED ISP VALUES FROM LEWIS GT 18')
173      ERR = .TRUE.
174      RETURN
175      R622 IF (IRKT01.EQ.1) CALL RKTOUT
176           IF (TT.EQ.0.) AREA=.FALSE.
177           IF (.NOT.EQL.AND.TT.EQ.0.) WRITE(6,8621)
178      R62 FORMAT('105H0CALCULATIONS WERE STOPPED BECAUSE NEXT POINT IS MORE T
           THAN 50 DEG BELOW TEMP RANGE OF A CONDENSED SPECIES)
179           IF (ISV.EQ.0) GO TO 990
180           NPT = 2
           C
           C      SET INDICES AND ESTIMATES FOR NEXT POINT.
           C
181      R70 NPT = NPT + 1
182           IF (.NOT.EQL.AND.(ISV.NF.1.OR.SEQL)) GO TO 880
183           IF (ISV.EQ.1) ISV = -1
184           CALL SAVE
185      R80 IPP = IPP+1
186           IF (NPT.EQ.2) GO TO 331
187           IF (.NOT.AREA) APP(NPT)=PCP(IPP-2)
188           IF (AREA) APP(NPT)=EXP(APPL)
189           PR = P(IP)/APP(NPT)
190           GO TO 331
           C
           C      END OF PCP, SUBAR, AND SUPAR SCHEDULES.
           C
191      990 IF (NSUB.LT.0) NSUB=-NSUB
192           NPT = 1
           C
           C      ARE THERE MORE ASSIGNED.
           C      1) CHAMBER PRESSURES(IP = NP)
           C      2) CHAMBER TEMPERATURES(IT = NT)
           C      3) O/F VALUES(IOF = NOF)
           C
193           IF (IP.EQ.NP.AND.IT.EQ.NT.AND.IOF.EQ.NOF) GO TO 1000
194           CALL SAVE
195           TT = TTT(1)
196      998 CONTINUE
197           IF (IT.GE.NT) GO TO 999
198           IT = IT+1
199           TT = T(IT)
200           GO TO 322
201      999 IF (IOF.GE.NOF) GO TO 1000
202           GO TO 321
203      1000 RETURN
204           END

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I N D E X

SUBROUTINE ROCKET

PAGE 209

APP	-	12CO	17=	66=	67	85=	89=	90	94	132=	133	187=	188=	189
APPL	-	109=	110=	111=	115=	117=	129=	131	132	188				
ARATIO	-	105=	106=	107	110	111	120	121	136	149WR				
AREA	-	5LG	12CO	43=	98	101=	147=	179=	187	188				
ASQ	-	2DB	76=	77	89	126=	127							
ATOM	-	10CO												
AVG	-	130A	158	159	163	164								
AW	-	164=	166											
AWT	-	12CO	93=	96										
AWZ	-	159=	160											
* BLK001	-	6*												
* BLK002	-	7*												
H0	-	10CO												
HOP	-	10CO												
CALCH	-	5LG	11CO	38										
CHECK	-	119=	120											
COEF	-	4DB	9CO											
CONVG	-	11CO												
CPCVE0	-	11CO												
CPCVFR	-	11CO												
CPR	-	3DB	8CO	83	155=									
CPRF	-	62=	155	156										
CPSUM	-	10CO	62											
CR	-	10CO												
CSTAR	-	160=	165											
CSTR	-	12CO												
DATA	-	10CO												
DD	-	83=	84											
DELN	-	4DB	9CO											
DELTAE	-	121=												
DENS	-	10CO												
OH	-	77=	78	79										
ULNP	-	103=	122	128=	129									
OLNPE	-	127=	128											
DLT	-	82=	83											
DLVPT	-	3DB	8CO											
DLVTP	-	3DB	8CO	83										
ELN	-	107=	109	115	117	128								
EN	-	4DB	9CO											
ENLN	-	4DB	9CO											
ENLSAV	-	10CO												
ENN	-	10CO	76	83	89	93	96	126						
ENNL	-	10CO												
ENSAVE	-	10CO												
ENTH	-	10CO												
EOL	-	5LG	12CO	18=	31	47=	57=	154	177	182				
* EQLHRM	-	52*												
EORAT	-	10CO												
ERR	-	5LG	6CO	173=										
* EXP	-	84	132	188										
FAZ	-	10CO												
FOX	-	10CO												
FPCT	-	10CO												
FROZ	-	5LG	12CO											
GAMMAS	-	3DB	8CO	66	68	74=	76	89	115	126	127	156=		

PAGE 211

P	-	8CO	50	85	90	133	189						
PCP	-	12CO	21	187									
PCPLT	-	94=	109	117									
PECWT	-	10CO											
PERF	-	12*											
* POINTS	-	8*											
PP	-	10CO	50=	67=	84=	85	90=	93	96	133=	189=		
PPP	-	8CO	67	159	160	164	166	167					
R	-	10CO											
* RETURN	-	38*	174*	203*									
RHO	-	10CO											
RHUP	-	10CO											
* RKTOUT	-	175*											
RMW	-	10CO											
* ROCKET	-	1*											
RR	-	10CO	71	76	89	126	158	159	163	164			
RTEMP	-	10CO											
S	-	4DB	9CO										
* SAVE	-	184*	194*										
SEGL	-	5LG	31=	57	182								
SHOCK	-	11CO											
SILOPT	-	7CO	163=	164	166								
SILVAC	-	7CO	166=										
SIZF	-	10CO											
SLN	-	9CO											
SLZ	-	158=	159										
SONVEL	-	8CO											
SP	-	5LG	11CO	46=	60=								
* SPECES	-	9*											
SPIN	-	12CO											
* SQRT	-	117											
SSUM	-	3DR	8CO	61									
SSC	-	12CO											
SUR	-	9CO											
SUBAR	-	12CO	28	105	109								
SUMN	-	10CO											
SUPAR	-	12CO	29	106	113	114							
SO	-	10CO	61=										
T	-	8CO	39	40	44	45	199						
TCEST	-	5LG	14=	44	45								
TEMP	-	9CO											
THI	-	5LG	65=	73	86=								
THIGH	-	10CO											
TLN	-	10CO											
TLOW	-	10CO											
TM	-	10CO											
TMELT	-	63=	81	82	88=								
TMID	-	10CO											
TOTN	-	8CO											
TP	-	5LG	11CO	45=	58=								
TRACE	-	10CO											
TT	-	10CO	33=	38	40=	53	68=	76	82	88	89		
TTY	-	176	177	195=	199=								
USQ	-	8CO	96	159	164	195							
	-	2OR	71=	77	89	93	96	127					

D256-10020-4

I N D E X

SUBROUTINE ROCKET

PAGE 212

V	-	8C0			
VACI	-	12C0			
VLM	-	8C0			
VMIN	-	10C0			
VMOC	-	12C0			
VOL	-	11C0			
VPLS	-	10C0			
WM	-	8C0	156	159	164
WP	-	10C0			

1	SUBROUTINE RKOUT	23650
C		23660
C	ROCKET PERFORMANCE PARAMETERS	23670
C		23680
C	THE FOLLOWING DOUBLE PRECISION TYPE STATEMENTS ARE REQUIRED FOR	23690
C	IBM 360 MACHINES ONLY	23700
C		23710
2	DOUBLE PRECISION HSUM,SSUM,CPR,DLVTP,DLVPT,GAMMAS	23720
3	DOUBLE PRECISION COEF,S,EN,ENLN,H0,DELN	23730
C		23740
4	LOGICAL EQL,FROZ,TP,HP,SP,SHOCK,AREA	23750
C		23760
5	DIMENSION NV(13),7(10,4)	23770
C		23780
6	COMMON/POINTS/HSUM(13),SSUM(13),CPR(13),DLVTP(13),DLVPT(13)	23790
	1 ,GAMMAS(13),P(26),T(26),Y(13),PPP(13),WM(13),SONVEL(13),TTT(13)	23800
	2 ,VLM(13),TOTN(13)	23810
7	COMMON/SPECES/COEF(2,7,115),S(115),EN(115,13),ENLN(115),H0(115)	
	1 ,DELN(115),A(15,115),SUB(115,3),IUSE(115),TEMP(50,2),SLN(115)	
8	COMMON/MISC/ENN,SUMN,TT,S0,ATOM(3,101),LLMT(15),R0(15),BOP(15,2)	23840
	1 ,TM,TLOW,TMID,THIGH,PP,CPSUM,OF,EQRAT,FPCT,R,RR,HSUB0,AC(2),AM(2)	23850
	2 ,HPP(2),RH(2),VMIN(2),VPLS(2),WP(2),DATA(22),NAME(15,5)	23860
	3 ,ANUM(15,4),PECWT(15),ENTH(15),FAZ(15),RTMP(15),FOX(15),DENS(15)	23870
	4 ,RHOP,RMW(15),TLN,CR,OXF(15),ENNL,ENSAVE,ENLSAV,TRACF,S17F	
9	COMMON/INDX/ CONVG,TP,HP,SP,ISV, NPP, MOLES,NP,NT,NPT,NLM	
	1 ,NS,KMAT,IMAT,I01,NOF,NOMIT,IP,NEW,NSUB,NSUP,ITM,CPCVFR,CPCVEQ	23900
	2 ,IONS,NC,INSERT,J0L,I0,KASE,NREAC,IC,J01,VOL,SHOCK,IT,NFZ,CALCH	23910
	3 ,IQSAVE,LSAVE,ISUP,ISUB,ITNUM	23920
10	COMMON/PERF/PCP(22),VMOC(13),SPIM(13),VACI(13),SUBAR(13),SUPAR(13)	23930
	1 ,APP(13),AEAT(13),CSTR,EGL,FROZ,SS0,AREA,AWT	23940
11	COMMON/OUT/FMT(30),FP(4),FT(4),FH(4),FS(4),FM(4),FV(4),FD(4)	23950
	1 ,FC(4),FG(4),FB,FMT13,F1,F2,F3,F4,F5,FL(4),FMT19,FAL,FA2	23960
	2 ,FRI,FC1,FN(4),FR(4),FA(4),FI(4),FMT9X,F0	23970
C		23980
12	EQUIVALENCE (V,NV),(Z,H0)	23990
C		24000
13	DATA EXIT/4HEXIT/	24010
C		24020
14	WRITE(6,37)	24040
15	37 FORMAT(1H1/24X,84HTHEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBR	24050
	1IUM COMPOSITION DURING EXPANSION /)	24060
16	GO TO 39	24070
17	39 IF(TTT(1).EQ.T(IT)) WRITE(6,737)	24130
18	737 FORMAT(52X,28HAT AN ASSIGNED TEMPERATURE ----)	24140
19	TEM = PPP(1)*14.696006	24150
20	WRITE(6,40) TEM	24160
21	40 FORMAT(5H0PC = ,F8.1,5H PSIA)	24170
22	CALL OUT1	24180
23	NEX = NPT - 2	24190
24	DO 862 I = 1,NEX	24200
25	862 V(I) = EXIT	24210
26	WRITE(6,48) (V(I),I=1,NEX)	24220
27	48 FORMAT(1H0,16X,16HCHAMBER THROAT,11(5X,4))	24230
C		24240
C	PRESSURE RATIOS	24250

```

      C
28      FMT(4) = FMT(6)
29      CALL VARFMT (APP,NPT)
30      WRITE (6,FMT) FR1,FR,FB,FB,(APP(J),J=1,NPT)
31      CALL OUT2
      C
32      AGV = 9.80665
33      DO 202 K=2,NPT
34      SPIM(K) = (2.*RR*(HSUM(1)-HSUM(K))**.5/AGV
      C
      C AW (A/W) IN UNITS OF SEC/ATM
      C
      C
35      AW = RR*TTT(K)/(PPP(K)* WM(K)*SPIM(K)*AGV**2)
36      IF(K.NE.2)GO TO 200
37      CSTR = 32.174*PPP(1)*AW
38      AEAT(2) = 1.
39      200 VACI(K)=SPIM(K)*PPP(K)*AW
40      IF (SONVEL(K).NE.0.) VMOC(K)=SPIM(K)*AGV/SONVEL(K)
41      NV(K)= CSTR + .5
42      202 CONTINUE
      C
      C MACH NUMBER
      C
      C
43      VMOC(1)=0.
44      IF(GAMMAS(2).EQ.0.) VMOC(2)=0.
45      FMT(7) = F3
46      WRITE(6,FMT) (FN(I),I=1,4),(VMOC(J),J=1,NPT)
47      WRITE (6,208)
48      208 FORMAT (1H )
      C
      C AREA RATIO
      C
      C
49      FMT(4) = FMT9X
50      CALL VARFMT (AEAT,NPT)
51      FMT(5) = F3
52      WRITE(6,FMT)FA1,FA2,FB,FB,(AEAT(J),J=2,NPT)
      C
      C C*
      C
      C
53      FMT(5) = FMT13
54      FMT(6) = FMT19
55      FMT(7) = F3
56      WRITE(6,FMT) (FR(I),I=1,4),(NV(J),J=2,NPT)
      C
      C CF - THRUST COEFFICIENT
      C
      C
57      FMT(6) = FMT(8)
58      FMT(7) = F3
59      DO 212 I=2,NPT
60      212 V(I)=32.174*SPIM(I)/CSTR
61      WRITE(6,FMT)FC1,FB,FR,FB,(V(J),J=2,NPT)
      C
      C VACUUM IMPULSE
      C
      C
62      FMT(5) = FMT13

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24690
24700
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24800

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63	FMT(7) = F1	24810
64	WRITE(6,FMT) (FA(I),I=1,4),(VACI(J),J=2,NPI)	24820
	C	24830
	C SPECIFIC IMPULSE	24840
	C	24850
65	WRITE(6,FMT) (FI(I),I=1,4),(SPIN(J),J=2,NPT)	24860
66	WRITE(6,208)	24870
67	FMT(4) = F8	24880
68	FMT(5) = FMT13	24890
69	FMT(7) = F5	24900
70	IF(EOL) GO TO 312	24910
71	WRITE(6,310)	24920
72	310 FORMAT(15H0MOLE FRACTIONS, //)	24930
	C	24940
	C MOLE FRACTIONS - FROZEN	24950
	C	24960
73	TRA = 5.E-6	24970
74	IF(TRACE.NE.0.) TRA=TRACE	24980
75	LINE = 0	24990
76	DO 430 K = 1,NS	25000
77	V(LINE+1) = EN(K,NF7)/TOTN(NFZ)	25010
78	IF(V(LINE+1).LT.TRA) GO TO 424	25020
79	LINE = LINE+1	25030
80	Z(LINE,1) = SUB(K,1)	25040
81	Z(LINE,2) = SUB(K,2)	25050
82	Z(LINE,3) = SUB(K,3)	25060
83	Z(LINE,4) = V(LINE)	25070
84	424 IF (LINE.NF.4.AND.K.NE.NS) GO TO 430	25080
85	IF (LINE.EQ.0) GO TO 312	25090
86	WRITE(6,426) (Z(LN,1),Z(LN,2),Z(LN,3),Z(LN,4),LN=1,LINE)	25100
87	426 FORMAT(1H,4(3A4,F9.5,7X))	25110
88	LINE = 0	25120
89	430 CONTINUE	25130
90	312 CALL OUT3	25140
91	1000 RETURN	25150
92	END	25160

SYMBOL	-----	REFERENCES	-----
37	- 14WR	15*	
39	- 16	17*	
40	- 20WR	21*	
48	- 26WR	27*	
200	- 36	39*	
202	- 33DO	42*	
208	- 47WR	48*	66WR
212	- 59DO	60*	
310	- 71WR	72*	
312	- 70	85	90*
424	- 78	84*	
426	- 86WR	87*	
430	- 76DO	84	89*
737	- 17WR	18*	
862	- 24DO	25*	
1000	- 91*		
A	- 7CO		
AC	- 8CO		
AEAT	- 10CO	38=	50AG 52WR
AGV	- 32=	34	35 40
AM	- 8CO		
ANUM	- 8CO		
APP	- 10CO	29AG	30WR
AREA	- 4LG	10CO	
ATOM	- 8CO		
AW	- 35=	37	39
AWT	- 10CO		
BO	- 8CO		
BOP	- 8CO		
CALCH	- 9CO		
COEF	- 30B	7CO	
CONVG	- 9CO		
CPCVEQ	- 9CO		
CPCVFR	- 9CO		
CPR	- 20B	6CO	
CPSUM	- 8CO		
CR	- 8CO		
CSTP	- 10CO	37=	41 60
DATA	- 8CO		
DELN	- 30B	7CO	
DENS	- 8CO		
DLVPT	- 20B	6CO	
DLVTP	- 20B	6CO	
EN	- 30B	7CO	77
ENLN	- 30B	7CO	
ENLSAV	- 8CO		
ENN	- 8CO		
ENNL	- 8CO		
ENSAVE	- 8CO		
ENTH	- 8CO		
EOL	- 4LG	10CO	70
EQRAT	- 8CO		
EXIT	- 130A	25	

FA	-	11CO	64WR																
FAZ	-	8CO																	
FA1	-	11CO	52WR																
FA2	-	11CO	52WR																
FB.	-	11CO	30WR	51	52WR	55	61WR	67											
FC	-	11CO																	
FC1	-	11CO	61WR																
FD	-	11CO																	
FG	-	11CO																	
FH	-	11CO																	
FI	-	11CO	65WR																
FL	-	11CO																	
FM	-	11CO																	
FMT	-	11CO	28=	30WR	45=	46WR	49=	51=	52WR	53=	54=	55=	56WR	57=					
		58=	61WR	62=	63=	64WR	65WR	67=	68=	69=									
FMTI9	-	11CO	54																
FMT13	-	11CO	53	62	68														
FMT9X	-	11CO	49																
FN	-	11CO	46WR																
FOX	-	8CO																	
FP	-	11CO																	
FPCT	-	8CO																	
FR	-	11CO	56WR																
FROZ	-	4LG	10CO																
FR1	-	11CO	30WR																
FS	-	11CO																	
FT	-	11CO																	
FV	-	11CO																	
F0	-	11CO																	
F1	-	11CO	63																
F2	-	11CO																	
F3	-	11CO	45	58															
F4	-	11CO																	
F5	-	11CO	69																
GAMMAS	-	2DB	6CO	44															
HP	-	4LG	9CO																
HPP	-	8CO																	
HSUR0	-	8CO																	
HSUM	-	2DB	6CO	34															
H0	-	3DB	7CO	12FO															
I	-	2400	25	26WR	46WR	56WR	59DO	60	64WR	65WR									
IC	-	9CO																	
IMAT	-	9CO																	
INDX	-	9R																	
IONS	-	9CO																	
IP	-	9CO																	
IQSAVE	-	9CO																	
IQ1	-	9CO																	
ISUR	-	9CO																	
ISUP	-	9CO																	
ISV	-	9CO																	
IT	-	9CO	17																
ITM	-	9CO																	
ITNUM	-	9CO																	
IUSE	-	7CO																	

		THE VARIABLE- J		-IS USED BEFORE IT IS DEFINED											
		30WR	46WR	52WR	56WR	61WR	64WR	65WR							
J	-	30WR	46WR	52WR	56WR	61WR	64WR	65WR							
JLIO	-	9C0													
JSOL	-	9C0													
JSI	-	9C0													
K	-	3300	34	35	36	39	40	41	7600	77	80	81	82	84	
KASE	-	9C0													
KMAT	-	9C0													
LINF	-	75=	77	78	79=	80	81	82	83	84	85	86WR	88=		
LLMT	-	8C0													
THE VARIABLE- LN		-IS USED BEFORE IT IS DEFINED													
LN	-	86WR													
LSAVE	-	9C0													
MISC	-	8*													
MOLFS	-	9C0													
NAME	-	8C0													
NC	-	9C0													
NEWK	-	9C0													
NEX	-	23=	2400	26WR											
NFZ	-	9C0	77												
NLM	-	9C0													
NOF	-	9C0													
NOMIT	-	9C0													
NP	-	9C0													
NPP	-	9C0													
NPT	-	9C0	23	294G	30WR	3300	46WR	50AG	52WR	56WR	5900	61WR	64WR	65WR	
NREAC	-	9C0													
NS	-	9C0	7600	84											
NSERT	-	9C0													
NSUH	-	9C0													
NSUP	-	9C0													
NT	-	9C0													
NV	-	50I	12EQ	41=	56WR										
OF	-	8C0													
OUPT	-	11*													
OUT1	-	22*													
OUT2	-	31*													
OUT3	-	90*													
OXF	-	8C0													
P	-	6C0													
PCP	-	10C0													
PECWT	-	8C0													
PERF	-	10*													
POINTS	-	6*													
PP	-	8C0													
PPP	-	6C0	19	35	37	39									
R	-	8C0													
RETURN	-	91*													
RH	-	8C0													
RHOP	-	8C0													
RKTOUT	-	1*													
RMW	-	8C0													
RR	-	8C0	34	35											
RTEMP	-	8C0													
S	-	3DB	7C0												

.....

1		BLOCK DATA	32420
2	C	DIMENSION ATEM(3,50)	32430
			32440
3	C	COMMON/MISC/ENN,SUMN,TT,S0,ATOM(3,101),LLMT(15),B0(15),B0P(15,2)	32450
		1, TM, TLOW, TMID, THIGH, PP, CPSUM, OF, EQRT, FPCT, R, RR, HSUR0, AC(2), AM(2)	32460
		2, HPP(2), RH(2), VMIN(2), VPLS(2), WP(2), DATA(22), NAME(15,5)	32470
		3, ANUM(15,5), PFCWT(15), ENTH(15), FAZ(15), RTEMP(15), FOX(15), DENS(15)	32480
		4, RHOP, RMW(15), TLN, CR, OXF(15), ENNL, ENSAVE, ENLSAV, TRACF, SIZE	32490
4		COMMON/OUT/FMT(30), FP(4), FT(4), FH(4), FS(4), FM(4), FV(4), FD(4)	32510
		1, FC(4), FG(4), FB, FMT13, F1, F2, F3, F4, F5, FL(4), FMT19, FA1, FA2	32520
		2, FR1, FC1, FN(4), FR(4), FA(4), FI(4), FMT9X, F0	32530
	C		32540
5		EQUIVALENCE (ATOM(1,52),ATEM)	32550
	C		32560
	C	ATOMIC SYMBOLS, WEIGHTS, AND VALENCES	32570
	C		32580
6		DATA ATOM/	32590
	A	2HH, 1.00797, 1., 2HHE, 4.0026, 0., 2HLI, 6.939, 1.,	32600
	B	2HHE, 9.0122, 2., 2HB, 10.811, 3., 2HC, 12.01115, 4.,	32610
	C	2HN, 14.0067, 0., 2HO, 15.9994, -2., 2HF, 18.9984, -1.,	32620
	D	2HNE, 20.183, 0., 2HNA, 22.9898, 1., 2HMG, 24.312, 2.,	32630
	E	2HAL, 26.9815, 3., 2HSI, 28.086, 4., 2HP, 30.9738, 5.,	32640
	F	2HS, 32.064, 4., 2HCL, 35.453, -1., 2HAR, 39.948, 0.,	32650
	G	2HK, 39.102, 1., 2HCA, 40.080, 2., 2HSC, 44.956, 3.,	32660
	H	2HTI, 47.900, 4., 2HV, 50.942, 5., 2HCR, 51.996, 3.,	32670
	I	2HMN, 54.9380, 2., 2HFE, 55.847, 3., 2HCO, 58.9332, 2.,	32680
	J	2HNI, 58.710, 2., 2HCU, 63.540, 2., 2HZN, 65.370, 2.,	32690
	K	2HGA, 69.720, 3., 2HGE, 72.590, 4., 2HAS, 74.9216, 3.,	32700
	L	2HSE, 78.960, 4., 2HBR, 79.909, -1., 2HKR, 83.800, 0.,	32710
	M	2HRB, 85.47, 1., 2HSP, 87.620, 2., 2HY, 88.905, 3.,	32720
	N	2HZR, 91.220, 4., 2HNB, 92.906, 5., 2HMO, 95.94, 6.,	32730
	U	2HTC, 99.000, 7., 2HRU, 101.070, 3., 2HRH, 102.905, 3.,	32740
	P	2HPD, 106.400, 2., 2HAG, 107.870, 1., 2HCD, 112.400, 2.,	32750
	Q	2HIN, 114.820, 3., 2HSN, 118.690, 4., 2HSB, 121.750, 3.,	32760
		DATA ATEM/	32770
	R	2HTE, 127.600, 4., 2HT, 126.9044, -1., 2HXE, 131.300, 0.,	32780
	S	2HCS, 132.905, 1., 2HBA, 137.340, 2., 2HLA, 139.910, 3.,	32790
	T	2HCE, 140.120, 3., 2HPR, 140.907, 3., 2HND, 144.240, 3.,	32800
	U	2HPM, 145.000, 3., 2HSM, 150.350, 3., 2HEU, 151.960, 3.,	32810
	V	2HGD, 157.250, 3., 2HTR, 158.924, 3., 2HDY, 162.500, 3.,	32820
	W	2HHO, 164.930, 3., 2HER, 167.260, 3., 2HTM, 168.934, 3.,	32830
	X	2HYB, 173.040, 3., 2HLU, 174.997, 3., 2HMF, 178.490, 4.,	32840
	Y	2HTA, 180.948, 5., 2HW, 183.850, 6., 2HRE, 186.200, 7.,	32850
	Z	2HOS, 190.200, 4., 2HIR, 192.200, 4., 2HPT, 195.090, 4.,	32860
	A	2HAU, 196.967, 3., 2HMG, 200.590, 2., 2HTL, 204.370, 1.,	32870
	B	2HPB, 207.190, 2., 2HBI, 208.980, 3., 2HPO, 210.040, 2.,	32880
	C	2HAT, 210.000, 0., 2HRN, 222.000, 0., 2HFR, 223.000, 1.,	32890
	D	2HRA, 226.000, 2., 2HAC, 227.000, 3., 2HTH, 232.038, 4.,	32900
	E	2HPA, 231.000, 5., 2HU, 238.030, 6., 2HNP, 237.000, 5.,	32910
	F	2HPU, 242.000, 4., 2HAM, 243.000, 3., 2HCM, 247.000, 3.,	32920
	G	2HBK, 249.000, 3., 2HCF, 251.000, 3., 2HES, 254.000, 0.,	32930
	H	2HFM, 253.000, 0., 2HD, 2.014102, 1.,	32940
	C		32950
	C INFORMATION USED IN VARIABLE OUTPUT FORMAT	32960

8	C	DATA FMT/3H(1H,4H,3A4,4H,A2,,3HF9,,2H0,,3HF9,,2H0,,3HF9,,2H0,,3HF9	32970
		1,,2H0,,3HF9,,2H0,,3HF9,,2H0,,3HF9,,2H0,,3HF9,,2H0,,3HF9,,2H0,,3HF9	32980
		2,,2H0,,3HF9,,2H0,,3HF9,,2H0,,3HF9,,1H0,1H)/,FB,F0,F1,F2,F3,F4,F5/	32990
		31H ,2H0,,2H1,,2H2,,2H3,,2H4,,2H5,,/FMT13/2H13/,FMT9X/3H9X/,/FMT19	33000
		4/3H19,/	33010
9		DATA FP/4HP, A,4HTM ,2H ,1H /	33020
		1,FT/4HT, D,4HEG K,4H ,2H /,FH/4HH, C,4HAL/G,2H ,1H /	33030
		2,FS/4HS, C,4HAL/(,4HG) (K,2H) /,FH/4HH, M,4HOL W,2HT ,1H /	33040
		3,FV/4H(DLV,4H/DLP,4H)T ,2H /,FD/4H(DLV,4H/OLT,2H)P,1H /	33050
		4,FC/4HCP, ,4HCA/,,4H(G) (,2HK)/,FG/4HGAMM,4HA (S,2H) ,1H /	33060
		5,FL/4HSON ,4HVFL,,4HM/SE,2HC /	33070
	C		33080
	C	INFORMATION USED IN PERFORMANCE OUTPUT	33090
	C		33100
10		DATA FR1/4HPC/P/, FC1/2HCF/, FN/4HMACH,4H NUM,4HRER ,1H /	33110
		1,FR/4HCSTA,4HR, F,4HT/SE,2HC /,FI/4HISP,,4H LR=,4HSEC/,2HLR/	33120
		2,FA/4HIVAC,4H,LR=,4HSEC/,2HLR /,FA1/4HAE/A/,FA2/1HT/	33130
11		END	33140
			33150

SYMBOL	-----	REFERENCES	-----
AC	- 3C0		
AM	- 3C0		
ANUM	- 3C0		
ATFM	- 201	5EQ 7DA	
ATOM	- 3C0	5EQ 6DA	
BLDATA	- 1 ^a		
B0	- 3C0		
B0P	- 3C0		
CPSUM	- 3C0		
CR	- 3C0		
DATA	- 3C0		
UENS	- 3C0		
ENLSAV	- 3C0		
ENN	- 3C0		
ENNL	- 3C0		
ENSAVE	- 3C0		
ENTH	- 3C0		
EGRAT	- 3C0		
FA	- 4C0	10DA	
FAZ	- 3C0		
FA1	- 4C0	10DA	
FA2	- 4C0	10DA	
FH	- 4C0	8DA	
FC	- 4C0	9DA	
FC1	- 4C0	10DA	
FD	- 4C0	9DA	
FG	- 4C0	9DA	
FH	- 4C0	9DA	
FJ	- 4C0	10DA	
FL	- 4C0	9DA	
FM	- 4C0	9DA	
FMT	- 4C0	8DA	
FMT19	- 4C0	8DA	
FMT13	- 4C0	8DA	
FMT9X	- 4C0	8DA	
FN	- 4C0	10DA	
FOX	- 3C0		
FP	- 4C0	9DA	
FPCT	- 3C0		
FR	- 4C0	10DA	
FR1	- 4C0	10DA	
FS	- 4C0	9DA	
FT	- 4C0	9DA	
FV	- 4C0	9DA	
F0	- 4C0	8DA	
F1	- 4C0	8DA	
F2	- 4C0	8DA	
F3	- 4C0	8DA	
F4	- 4C0	8DA	
F5	- 4C0	8DA	
HPP	- 3C0		
HSUB0	- 3C0		
LLMT	- 3C0		

INDEX

BLOCK DATA

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* MISC      -      3*
  NAME      -      3C0
  OF        -      3C0
* DUPT      -      4*
  OXF       -      3C0
  PECWT     -      3C0
  PP        -      3C0
  R         -      3C0
  RH        -      3C0
  RHOP      -      3C0
  RMW       -      3C0
  RR        -      3C0
  RTEMP     -      3C0
  SIZE      -      3C0
  SUMN      -      3C0
  SO        -      3C0
  THIGH     -      3C0
  TLN       -      3C0
  TLOW      -      3C0
  TM        -      3C0
  TMID      -      3C0
  TRACE     -      3C0
  TT        -      3C0
  VMIN      -      3C0
  VPLS      -      3C0
  WP        -      3C0

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1      SUBROUTINE IDNOZL (R1,R2,XX1,XX2)
2      C      ONE-DIMENSIONAL NOZZLE PROGRAM
3      IMPLICIT REAL*8 (A-H,O-Z)
4      REAL*4 R1,R2,XX1,XX2
5      EXTERNAL FOFPR
6      COMMON/NPHRC/NPPR(10)
7      COMMON/COM01/TSTAGK,TEXTK,CHEN,EXEN,PROP,WTMOIG,CUGO,
8      1 PARWT,KCH,SLOP1,SLOP2,RARCI,RARC2,ARF,NOZTYP,IDRUG,IDNPRT
9      COMMON/CPRNT/CHANGE,XTH,FR10,KPRNT
10     COMMON/COM02/ETAG,ETAP,H2,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
11     1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPH,CPS,
12     2 DELU,DENOM,DMOND,DMONU,DNLST,DOMAX,DUMAX,DX,DX0,EPS1,EPS2,EPST,
13     3 EPSM2,EPSN,EPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
14     4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,HOD,HOU,HONX,HLM,HM,HSM,HSTAG,
15     5 HUPX,P,PRG,PSTAG,QUED,QUEH,R,RC,REP,REGAS,RHO,RH00NL,RHOST,RP,
16     6 RTH,STGMA,SIGX,SOPM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
17     7 UG00,UG0DN,UG0UP,UGDNX,UGUPX,UP,UPO,UPODN,UPOUP,UPDNX,UPUPX,UT,
18     8 WPGW,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
19     COMMON/COM03/ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
20     1 UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
21     2 WORK(33),XDN(500),XTBL(500),XUP(500)
22     COMMON/COM04/CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUE2,CUE4,CUE5,DY1LST,
23     1 EL0,EL1,EL2,EL4,GAMRAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,FL2MH,
24     2 UTPR,RPLST
25     COMMON/COM05/IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,FLAG,LINFS,N,NDN,
26     1 NTRY,NUP,NDEG,NPTS
27     COMMON/COM06/ADD,A(9),RL(200),XL(200),HDELT,RANDER,RMDRK,AR,
28     1 RTHRT,XSAVE
29     RTH=R1
30     RP=R2
31     XP=XX1
32     XG=XX2
33     CALL PRECAL
34     NPTS=0
35     K=3
36     TSTAG = 1.8*TSTAGK
37     DO 45 I=1,10
38     45 NPPR(I)=1
39     IF (IDNPRT.EQ.0) GO TO 111
40     WRITE (6,301)
41     301 FORMAT(1H1,5X,35HTHE FOLLOWING QUANTITIES WERE INPUT/)
42     WRITE (6,302) PSTAG,TSTAGK,TEXTK,CHEN,EXEN,GMUS,WTMOIG,SIG
43     1MA,XP,XG,RP,CUGO,NOZTYP,NPTS
44     302 FORMAT(15H STAG PRESSURE=,1F7.2,4HPSIA,10X,10HSTAG TEMP=,1F8.3,10
45     1HDEG KELVIN,08X,10HEXIT TEMP=,1F8.3,10HDEG KELVIN,15H STAG ENTHAL
46     2PY=,1F8.3,9H CAL/GRAM,4X,14HEXIT ENTHALPY=,1F8.2,9H CAL/GRAM,5X,10
47     3HVIScosity=,1F8.7,09HL67FT-SEC,10H GAS MOLECULAR WEIGHT(CHAMBER)=,
48     4,1F9.5,6HSTGMA=,1F6.3,10H PARTICLE MOLE FRACTION(CHAMBER)=,
49     5,1F9.6,10H GAS MOLE FRACTION(CHAMBER)=,1F9.6,3X,16H PARTICLE RADIUS=,
50     6,1F5.3,7HMICRONS,10H
51     7 6H CUGO=,F6.3,24X,7HNOZTYP=,I1,28X,5HNPTS=,I5)
52     IF (PROP.GT.1.0) GO TO 305
53     WRITE (6,303)
54     303 FORMAT(1H1,63H THE FOLLOWING QUANTITIES ARE CONSTANTS FOR ALUMINUM PR
55     1OPELLANT/)

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31      GO TO 310
32      305 WRITE (6,306)
33      306 FORMAT (/63H THE FOLLOWING QUANTITIES ARE CONSTANT FOR BERYLLIUM P
      1ROPELLANT/)
34      310 WRITE(6,311) CPL,CPS,HLM,HSM,TM,PARWT,GMSSP
35      311 FORMAT(20H LIQUID PARTICLE CP=,1F8.3,10HFT SQ/SEC SQ-DEG R,8X,18HS
      1OLIU PARTICLE CP=,1F8.3,10HFT SQ/SEC SQ-DEG R,/26H LIQUID PARTICLE
      1 ENTHALPY=1E12.5,13H SQ FT/SQ SEC3X,24HSOLID PARTICLE FNTHALPY=,1E
      112.5,12HFT SQ/SEC SQ,/11H MELT TEMP=,1F7.2,5HDEG R,31X,23HPARTICLE
      2 ATOMIC WEIGHT=,1F6.2,/01X,15HPART M DENSITY=,1F5.1)
36      111 CONTINUE
37      WPGW = XP/XG
38      CPMIX = ((CHEN-FXEN)/(TSTAG-TEXITK))*32.1/4*777.5
39      CPG = (CPMIX-XP*CPL)/XG
40      RGAS = (1545.33*32.174)/WTHOLG
41      GAMMA=1.0/(1.0-RGAS/CPG)
42      PRG = 4.0*GAMMA/(9.0*GAMMA-5.0)
43      IF (IDNPRT.EQ.0) GO TO 119
44      WRITE (6,312)
45      312 FORMAT(/41H THE FOLLOWING QUANTITIES WERE CALCULATED/)
46      WRITE(6,313) WPGW,CPMIX,CPG,RGAS,GAMMA,PRG
47      313 FORMAT(16H PART/GAS RATIO=,1F6.
      24,14X,11HMTXTUPE CP=,1F9.3,12HSOFT/SUSEC-H,4X,07HGAS CP=,1F9.3,012
      3HSOFT/SUSEC-R,/14H GAS CONSTANT=,1F8.3,18HSQ FT/SEC SQ-DEG R,32X,
      46HGAMMA=,1F8.6,/01X,12HPRANDTL NO.=,1F8.6)
48      WRITE (6,118)EPS1,FPSM,ATABL(1),RTABL(1)
49      118 FORMAT (5H0EPS=F6.4,10X,5HEPSM=F5.4,10X,13HR-K TOL(ARS)=F5.4,2X,
      1)3HR-K TOL(REL)=F7.6)
50      119 RP=RP/304800.0
51      EPS2=3.0*EPS1
52      EPSN=1.5*EPSM
53      EPSM2=0.2*FPSM
54      ATABL(2)=ATABL(1)
55      ATABL(3)=ATABL(1)
56      RTABL(2)=RTABL(1)
57      RTABL(3)=RTABL(1)
58      RTOL=0.01*RP
59      RPART=RP
60      RHOST=4633.056/RGAS*PSTAG/TSTAG
61      IF (IDNPRT.EQ.0) GO TO 133
62      WRITE (6,13)RHOST
63      13 FORMAT (11H0RHO(STAG)=F8.6)
64      133 IF (NOZTYP.GT.1) GO TO 11
65      CALL CONICL(XF,RC,RTH,XT,1)
66      GO TO 14
67      11 CALL LKUP(XF,RC,RTH,XT,1)
68      14 IF (GAMMA.GT.1.0 .AND. GAMMA.LT. 1.7) GO TO 19
69      15 WRITE (6,16)
70      16 FORMAT (80H0THE VALUE COMPUTED FOR GAMMA IS NOT WITHIN THE LIMITS
      1(1.0,1.7). CASE REJECTED,')
71      RETURN
72      19 RPLST=0.0
73      25 DSIG=FOFRP(RPART)
74      RETURN
75      END

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1190
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1570

SYMBOL	REFERENCES
11	64 67*
13	62WR 63*
14	66 68*
15	69*
16	69WR 70*
19	68 72*
25	73*
45	2100 22*
111	23 36*
118	48WR 49*
119	43 50*
133	61 64*
301	24WR 25*
302	26WR 27*
303	29WR 30*
305	28 32*
306	32WR 33*
310	31 34*
311	34WR 35*
312	44WR 45*
313	46WR 47*
A	12C0
ALPHA	8C0
A00	12C0
AR	12C0
ARF	6C0
ATAHL	9C0 48WR 54= 55=
BLOW	8C0
CAYR	10C0
CAY1	10C0
CAY2	10C0
CAY4	10C0
CHANGE	7C0
CHEN	6C0 26WR 38
CNST1	8C0
CNST10	8C0
CNST2	8C0
CNST3	8C0
CNST4	8C0
CNST5	8C0
CNST6	8C0
CNST7	8C0
CNST8	8C0
CNST9	8C0
* COM01	6*
* COM02	8*
* COM03	9*
* COM04	10*
* COM05	11*
* COM06	12*
* CONICL	65*
CPCG	8C0
CPG	8C0 39= 41 46WR

I N D E X

SUBROUTINE IDNOZL (R1,R2,XX1,XX2)

PAGE 227

CPL - 8C0 34WR 39
 CPMIX - 38= 39 46WR
 CPP - 8C0
 * CPRNT - 7*
 CPS - 8C0 34WR
 CUEP - 10C0
 CUE0 - 10C0
 CUE1 - 10C0
 CUE2 - 10C0
 CUE4 - 10C0
 CUG0 - 6C0 26WR
 DELU - 8C0
 DENOM - 8C0
 DMOND - 8C0
 DMONU - 8C0
 DNLSL - 8C0
 DGMAX - 8C0
 DSIG - 73=
 DUMAX - 8C0
 DX - 8C0
 DX0 - 8C0
 DY - 9C0
 DY1LST - 10C0
 EL0 - 10C0
 EL1 - 10C0
 EL2 - 10C0
 EL2MH - 10C0
 EL4 - 10C0
 EPSM - 8C0 48WR 52 53
 EPSM2 - 8C0 53=
 EPSN - 8C0 52=
 EPSU - 8C0
 EPS1 - 8C0 48WR 51
 EPS2 - 8C0 51=
 ERROR - 8C0
 ETAG - 8C0
 ETAP - 8C0
 EULST - 8C0
 EXEN - 6C0 26WR 38
 FCTR - 8C0
 * FOFIP - 4EX 73
 FR10 - 7C0
 FX1 - 8C0
 FX2 - 8C0
 FX3 - 8C0
 G - 8C0
 GAMHAR - 10C0
 GAMMA - 8C0 41= 42 46WR 68
 GMACH - 8C0
 GMSSP - 8C0 34WR
 GMUG - 8C0
 GMUS - 8C0 26WR
 GNLSL - 8C0
 GNUM - 8C0
 H - 8C0

I N D E X

SUBROUTINE IDNOZL (R1,R2,XX1,XX2)

PAGE 22A

HDELT - 12C0
 HDN - 9C0
 HDNX - 8C0
 HLM - 8C0 34WR
 HM - 8C0
 HSM - 8C0 34WR
 HSTAG - 8C0
 HTHL - 9C0
 HUP - 9C0
 HUPX - 8C0
 HQ - 8C0
 HQD - 8C0
 HQU - 8C0
 I - 21D0 22
 IDBUG - 6C0
 * IDNOZL - 1*
 IDNPRT - 6C0 23 43 61
 IERR - 11C0
 K - 11C0 19=
 KFLG1 - 11C0
 KFLG2 - 11C0
 KFLG3 - 11C0
 KFLG4 - 11C0
 KPRNT - 7C0
 LFLAG - 11C0
 LINES - 11C0
 * LKUP - 67*
 N - 11C0
 NDEG - 11C0
 NDN - 11C0
 * NOZTYP - 6C0 26WR 64
 NPHRC - 5*
 NPPR - 5C0 22=
 NPTS - 11C0 18= 26WR
 NTRY - 11C0
 NUP - 11C0
 P - 8C0
 * PARWT - 6C0 34WR
 PREFCAL - 17*
 PRG - 8C0 42= 46WR
 PROP - 6C0 28
 PSTAG - 8C0 26WR 60
 QUAN1 - 10C0
 QUAN2 - 10C0
 QUAN3 - 10C0
 QUAN4 - 10C0
 QUAN5 - 10C0
 QUEO - 8C0
 QUEH - 8C0
 R - 8C0
 RAMDER - 12C0
 RARC1 - 6C0
 RARC2 - 6C0
 RC - 8C0 65AG 67AG
 RCH - 6C0

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I N D E X

SUBROUTINE IDNOZL (R1,R2,XX1,XX2)

PAGE 229

REP	-	8CO					
RETURN	-	71*	74*				
RGAS	-	8CO	40=	41	46WR	60	
RHO	-	8CO					
RHOST	-	8CO	60=	62WR			
RHOONL	-	8CO					
RL	-	12CO					
RMDPK	-	12CO					
RP	-	8CO	14=	26WR	50=	58	59
RPAWT	-	59=	73				
RPLST	-	10CO	72=				
RTABL	-	9CO	48WR	56=	57=		
RTH	-	8CO	13=	65AG	67AG		
RTHRT	-	12CO					
RTOL	-	48=					
R1	-	1AG	3RL	13			
R2	-	1AG	3RL	14			
SIGMA	-	8CO	26WR				
SIGX	-	8CO					
SLOP1	-	6CO					
SLOP2	-	6CO					
SQRM	-	8CO					
TAU	-	8CO					
TAUG	-	8CO					
TEXTK	-	6CO	26WR	38			
TG	-	8CO					
TG0	-	8CO					
TH	-	8CO	34WR				
TP	-	8CO					
TSTAG	-	8CO	20=	60			
TSTAGK	-	6CO	20	26WR	38		
TI	-	8CO					
UG	-	8CO					
UGUN	-	9CO					
UGDNX	-	8CO					
UGTHL	-	9CO					
UGUP	-	9CO					
UGUPX	-	8CO					
UG0	-	8CO					
UG0DN	-	8CO					
UG0UP	-	8CO					
UG00	-	8CO					
UP	-	8CO					
UPDN	-	9CO					
UPDNX	-	8CO					
UPTRL	-	9CO					
UPUP	-	9CO					
UPUPX	-	8CO					
UP0	-	8CO					
UP0DN	-	8CO					
UP0UP	-	8CO					
UT	-	8CO					
UTPR	-	10CO					
U0	-	8CO					
WORK	-	9CO					

INDEX

SUBROUTINE IDNOZL (R1,R2,XX1,XX2)

PAGE 230

WPWG	-	8C0	37=	46WR.
WTMOLG	-	6C0	26WR	40
X	-	8C0		
XDN	-	9C0		
XF	-	8C0	65AG	67AG
X6	-	16=	26WR	37 39
XL	-	12C0		
XMAX	-	8C0		
XP	-	15=	26WR	37 39
XSAVE	-	12C0		
XT	-	8C0	65AG	67AG
XTBL	-	9C0		
XTH	-	7C0		
XUP	-	9C0		
XX	-	8C0		
XX1	-	1AG	3RL	15
XX2	-	1AG	3RL	16
X0	-	8C0		
X00	-	8C0		
X1	-	8C0		
X2	-	8C0		
X3	-	8C0		

1	FUNCTION AREAR(Z)	8660
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NON,	
	1 NTRY,NUP,NDEG,NPTS	
4	COMMON/COM06/ AOD,A(9),RL(200),XL(200),HDELT,RAMDER,RMORR,AR,	
	1 RTHRT,XSAVE	
5	ARFAR=(RADIUS(Z)/RTHRT)**2-AR	8730
6	RETURN	8740
7	END	8750

SYMBOL	REFERENCES
A	4C0
AOD	4C0
AR	4C0
* AREAR	1* 5=
* COM05	3*
* COM06	4*
HDELT	4C0
IERR	3C0
K	3C0
KFLG1	3C0
KFLG2	3C0
KFLG3	3C0
KFLG4	3C0
LFLAG	3C0
LINF5	3C0
N	3C0
NDEG	3C0
NDN	3C0
NPTS	3C0
NTRY	3C0
NUP	3C0
THE VARIABLE= RADIUS -IS USED BEFORE IT IS DEFINED	
RADIUS	5
RAMDER	4C0
* RETURN	6*
RL	4C0
RMDRK	4C0
RTHRT	4C0 5
XL	4C0
XSAVE	4C0
Z	1AG 5

1	BLOCK DATA	28890
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	COMMON/COM01/TSTAGK,TEXITK,CHEN,EXEN,PROP,WTMOLG,CUGO,	
4	1 PARWT,RCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,INBUG,IDNPRT	
5	COMMON/TAH1C/INCX,INCY,ISER,ID,KLO	28920
6	COMMON /BOB/ KFLG	28930
7	COMMON/CPRNT/CHANGE,XTH,FR10,KPRNT	
8	DATA IDBUG/0/	
9	DATA IDNPRT/0/	
10	DATA FR10/1.58489/	
11	DATA NOZTYP/1/	
12	DATA CUGO/1.25/	
13	DATA ISER/0/,INCX,INCY/2*1/	29260
14	DATA KFLG/1/	29270
15	DATA KPRNT/0/	29280
16	DATA TSTAGK/3321.0/	29300
17	DATA TEXITK/1957.0/	29310
18	DATA CHEN /-433.11/	
19	DATA EXEN /-1225.4/	
20	DATA PROP/1.0/	
21	DATA PARWT /101.94/	29470
22	DATA WTMOLG/19.20641/	
	END	29610

SYMBOL	REFERENCES
ARF	3C0
* BLUATA	1*
* BOB	5*
CHANGE	6C0
CHEM	3C0 17DA
* COM01	3*
* CPRNT	6*
CUGO	3C0 11DA
EXEN	3C0 18DA
FR10	6C0 9DA
ID	4C0
IDBUG	3C0 7DA
IDNPRT	3C0 8DA
INCX	4C0 12DA
INCY	4C0 12DA
ISER	4C0 12DA
KFLG	5C0 13DA
KLO	4C0
KPRNT	6C0 14DA
NOZTYP	3C0 10DA
PARWT	3C0 20DA
PROP	3C0 19DA
RARC1	3C0
RARC2	3C0
RCH	3C0
SLOP1	3C0
SLOP2	3C0
* TAB1C	4*
IFXITK	3C0 16DA
TSTAGK	3C0 15DA
WTMOLG	3C0 21DA
XTH	6C0

```

1      SUBROUTINE CONICL (X,R,RPR,RDBLP,K)                                7030
2      IMPLICIT REAL*8 (A-H,O-Z)
3      COMMON/COM01/ISTAGK,TEXITK,CHEN,EXEN,PROP,WTMOLG,CUGO,
4      1 PARWT,RCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,IDHUG,IDNPRT
5      IF (K-2)20,30,29                                                    7040
6      20 RTH=RPR
7      SLOP1 = -DABS(SLOP1)
8      SLOP2 = DABS(SLOP2)
9      A=RARC1/DSQRT(1.0+SLOP1**2)
10     R1=RTH+RARC1-A                                                        7140
11     X1=(R1-RCH)/SLOP1                                                    7150
12     XT=X1-SLOP1*A                                                        7160
13     A=RARC2/DSQRT(1.0+SLOP2**2)
14     R2=RTH+RARC2-A                                                        7180
15     X2=XT+SLOP2*A                                                        7190
16     RF=RTH*DSQRT(ARF)
17     XF=X2+(RF-R2)/SLOP2                                                  7210
18     X=XF                                                                  7250
19     R=RCH                                                                  7260
20     RPR=RTH                                                                7270
21     RDBLP=XT                                                              7280
22     IF (IDNPRT.EQ.0) GO TO 29
23     24 WRITE (6,24)RCH,RTH,SLOP1,SLOP2,RARC1,RARC2,ARF
24     24 FORMAT (5H RCH=F7.4, 6H RTH=F7.4, 14H SLOPE (CONV)=F7.4, 13H SLO  7080
25     1PE (DIV)=F6.4, 12H R (UPSTRM)=F6.4, 12H R (DNSTRM)=F6.4, 5H ARF=F5.2  7090
26     2)
27     WRITE (6,26)XT,X1,R1,X2,R2,XF,RF
28     26 FORMAT (4H XT=F7.4, 7H X1=F7.4, 7H R1=F7.4, 7H X2=F7.4,  7230
29     17H R2=F7.4, 7H XF=F7.4, 7H RF=F7.4)
30     RETURN                                                                7240
31     30 IF (X)302,31,31                                                    7390
32     302 R=RCH                                                            7400
33     RPR=0.0                                                                7410
34     RDBLP=0.0                                                            7420
35     RETURN                                                                7430
36     31 IF (X-X1)32,32,34                                                  7440
37     32 R=RCH+SLOP1*X                                                    7450
38     RPR=SLOP1                                                            7460
39     RDBLP=0.0                                                            7470
40     RETURN                                                                7480
41     34 A=XT-X                                                            7490
42     IF (A)42,36,36                                                       7500
43     36 B=RTH+RARC1                                                       7510
44     R=B-DSQRT(RARC1**2-A*A)                                              7520
45     RPR=A/(R-B)                                                          7540
46     RDBLP=-(1.0+RPR**2)/(R-B)                                           7550
47     RETURN                                                                7560
48     42 IF (X-X2)44,46,46                                                 7570
49     44 B=RTH+RARC2                                                       7580
50     R=B-DSQRT(RARC2**2-A*A)
51     GO TO 37
52     46 R=R2+SLOP2*(X-X2)
53     RPR=SLOP2
54     RDBLP=0.0
55     RETURN

```

I N D E X

SUBROUTINE CONICL (X,R,RPR,RDBLP,K)

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52

END

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SYMBOL	-----	REFERENCES	-----
20	- 4 5*		
24	- 22WR 23*		
26	- 24WR 25*		
29	- 4 21 26*		
30	- 4 27*		
31	- 27 32*		
32	- 32 33*		
34	- 32 37*		
36	- 38 39*		
37	- 41* 47		
38	- 42*		
40	- 43*		
42	- 38 44*		
44	- 44 45*		
46	- 44 48*		
302	- 27 28*		
A	- 8= 9 11 12= 13 14 37= 38 40 41 46		
ARF	- 3C0 15 22WR		
B	- 39= 40 41 42 45= 46		
CHEN	- 3C0		
* COM01	- 3*		
* CONICL	- 1*		
CUGO	- 3C0		
* DAHS	- 6 7		
* DSURT	- 8 12 15 40 46		
EXEN	- 3C0		
IDBUG	- 3C0		
IDNPRT	- 3C0 21		
K	- 1A6 4		
NOZTYP	- 3C0		
PARWT	- 3C0		
PROP	- 3C0		
R	- 1A6 18= 28= 33= 40= 41 42 46= 48=		
RARC1	- 3C0 8 9 22WR 39 40		
RARC2	- 3C0 12 13 22WR 45 46		
RCH	- 3C0 10 18 22WR 28 33		
RDBLP	- 1A6 20= 30= 35= 42= 50=		
* RETURN	- 26* 31* 36* 43* 51*		
RF	- 15= 16 24WR		
RPR	- 1A6 5 19= 29= 34= 41= 42 49=		
RTH	- 5= 9 13 15 19 22WR 39 45		
R1	- 9= 10 24WR		
R2	- 13= 16 24WR 48		
SLOP1	- 3C0 6= 8 10 11 22WR 33 34		
SLOP2	- 3C0 7= 12 14 16 22WR 48 49		
TEXTK	- 3C0		
ISTAGK	- 3C0		
WTMOEG	- 3C0		
X	- 1A6 17= 27 32 33 37 44 48		
XF	- 16= 17 24WR		
XT	- 11= 14 20 24WR 37		
X1	- 10= 11 24WR 32		
X2	- 14= 16 24WR 44 48		

```

1      SUBROUTINE CONST (KSW)
2      IMPLICIT REAL*8 (A-H,O-Z)
3      COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
1      CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPP,CPS,
2      DFLU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EPS1,FP52,EP5M,
3      EPSM2,EP5N,FPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
4      GNSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,H0NX,HLM,HM,HSM,HSTAG,
5      HUPX,P,PRG,PSTAG,QUEH,QUEH,R,RC,REP,RGAS,RHO,RH00NL,RHOST,RP,
6      RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
7      UG00,UG0DN,UG0UP,UG0NX,UG0PX,UP,UP0,UP0DN,UP0UP,UP0NX,UP0PX,UT,
8      WPMG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
4      COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
1      UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
2      WORK(33),XDN(500),XTBL(500),XUP(500)
5      COMMON/COM04/ CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUF2,CUE4,CUER,DY1LST,
1      EL0,EL1,EL2,EL4,GAMBAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,FL2MH,
2      UTPR,RPLST
6      COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINFS,N,NDN,
1      NTRY,NUP,NDEG,NPTS
7      IF (KSW)40,20,30
8      20      CPP=CPL
9      HM=HLM
10     GO TO 50
11     30      CPP=CPS
12     HM=HSM
13     GO TO 50
14     40      IF (HLM-H)41,41,42
15     41      CPP=CPL
16     GO TO 52
17     42      IF (H-HSM)43,43,44
18     43      CPP=CPS
19     GO TO 52
20     44      CPP=CPL-(CPL-CPS)*(HLM-H)/(HLM-HSM)
21     GO TO 52
22     50      HSTAG=HM+CPP*(TSTAG-TM)
23     52      CNST1=0.5/(CPG+WPMG*CPP)
24     CPCG=CPP/CPG
25     RETURN
26     END

```

4940
5470
5480
5490
5500
5510
5520
5530
5540
5550
5560
5570
5580
5590
5600
5610
5620
5630
5640
5650
5660

D256-10020-4

ORIGINAL PAGE IS
OF POOR QUALITY

SYMBOL	-----	REFERENCES	-----
20	- 7 8*		
30	- 7 11*		
40	- 7 14*		
41	- 14 15*		
42	- 14 17*		
43	- 17 18*		
44	- 17 20*		
50	- 10 13 22* 23*		
52	- 16 19 21		
ALPHA	- 3C0		
ATARI	- 4C0		
BLOW	- 3C0		
CAYR	- 5C0		
CAY1	- 5C0		
CAY2	- 5C0		
CAY4	- 5C0		
CNST1	- 3C0 23=		
CNST10	- 3C0		
CNST2	- 3C0		
CNST3	- 3C0		
CNST4	- 3C0		
CNST5	- 3C0		
CNST6	- 3C0		
CNST7	- 3C0		
CNST8	- 3C0		
CNST9	- 3C0		
COM02	- 3*		
COM03	- 4*		
COM04	- 5*		
COM05	- 6*		
CONST	- 1*		
CPCG	- 3C0 24=		
CPG	- 3C0 23 24		
CPL	- 3C0 8 15 20		
CPP	- 3C0 9= 11= 15= 18= 20= 22 23 24		
CPS	- 3C0 11 18 20		
CUER	- 5C0		
CUE0	- 5C0		
CUE1	- 5C0		
CUE2	- 5C0		
CUE4	- 5C0		
DELU	- 3C0		
DENOM	- 3C0		
DMOND	- 3C0		
DMONU	- 3C0		
DNLST	- 3C0		
DQMAX	- 3C0		
DUMAX	- 3C0		
DX	- 3C0		
UX0	- 3C0		
DY	- 4C0		
DY1LST	- 5C0		
EL0	- 5C0		

2-241

D256-10020-4

EL1	-	500			
EL2	-	500			
EL2MH	-	500			
EL4	-	500			
EPSM	-	300			
EPSM2	-	300			
EPSN	-	300			
EPSU	-	300			
EPS1	-	300			
EPS2	-	300			
ERROR	-	300			
ETAG	-	300			
ETAP	-	300			
EULST	-	300			
FCIR	-	300			
FX1	-	300			
FX2	-	300			
FX3	-	300			
G	-	300			
GAMBAR	-	500			
GAMMA	-	300			
GMACH	-	300			
GMSSP	-	300			
GMUG	-	300			
GMUS	-	300			
GMLST	-	300			
GNUM	-	300			
H	-	300	14	17	20
H0N	-	400			
H0NX	-	300			
HLM	-	300	9	14	20
HM	-	300	9=	12=	22
HSM	-	300	12	17	20
HSTAG	-	300	22=		
HTBL	-	400			
HUP	-	400			
HUPX	-	300			
HQ	-	300			
H0D	-	300			
H0U	-	300			
IERR	-	600			
K	-	600			
KFLG1	-	600			
KFLG2	-	600			
KFLG3	-	600			
KFLG4	-	600			
KSW	-	1AG	7		
LFLAG	-	600			
LINES	-	600			
N	-	600			
NDEG	-	600			
NDN	-	600			
NPTS	-	600			
NTRY	-	600			
NUP	-	600			

I N D E X

SUBROUTINE CONST (KSW)

PAGE 242

P	-	300	
PRG	-	300	
PSTAG	-	300	
QUAN1	-	500	
QUAN2	-	500	
QUAN3	-	500	
QUAN4	-	500	
QUAN5	-	500	
QUED	-	300	
QUEH	-	300	
R	-	300	
RC	-	300	
REP	-	300	
RETURN	-	25*	
RGAS	-	300	
RHO	-	300	
RHOST	-	300	
RH00NL	-	300	
RP	-	300	
RPLST	-	500	
RTAFL	-	400	
RTH	-	300	
SIGMA	-	300	
SIGX	-	300	
SQRM	-	300	
TAU	-	300	
TAUG	-	300	
TG	-	300	
TG0	-	300	
TM	-	300	22
TP	-	300	
TSTAG	-	300	22
TY	-	300	
UG	-	300	
UGDN	-	400	
UGDNX	-	300	
UGTRL	-	400	
UGUP	-	400	
UGUPX	-	300	
UG0	-	300	
UG0DN	-	300	
UG0UP	-	300	
UG00	-	300	
UP	-	300	
UPDN	-	400	
UPDNX	-	300	
UPTBL	-	400	
UPUP	-	400	
UPUPX	-	300	
UP0	-	300	
UP0DN	-	300	
UP0UP	-	300	
UT	-	300	
UTPR	-	500	
U0	-	300	

INDEX

SUBROUTINE CONST (KSW)

PAGE 243

WORK	-	4C0	
WPWG	-	3C0	23
X	-	3C0	
XDN	-	4C0	
XF	-	3C0	
XMAX	-	3C0	
XT	-	3C0	
XTHI	-	4C0	
XUP	-	4C0	
XX	-	3C0	
X0	-	3C0	
X00	-	3C0	
X1	-	3C0	
X2	-	3C0	
X3	-	3C0	

```

1      SUBROUTINE CTRL1(INTRY)                                15780
2      IMPLICIT REAL*8 (A-H,O-Z)
3
4      C
5      C THIS ROUTINE DETERMINES WHETHER EQUATION 2 ON PAGE 1 OF THE USFRS
6      C MANUAL IS PROCEEDING TO A BLOWUP, BLOWDOWN OR EXACT SOLUTION. 15790
7      C
8      C
9      C
10     COMMON/PRINT/TERM1,TERM2,DIFF0,XLST
11     COMMON/COM01/TSTAGK,TEXITK,CHEN,EKEN,PROP,WTMOLG,CUGO,
12     1 PARWT,RCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,IDBUG,IDNPRT
13     COMMON/COM02/ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
14     1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPC6,CP6,CPL,CPP,CPS,
15     2 DFLU,DENOM,DMOND,DMONU,DNLST,DOMAX,DUMAX,DX,DX0,EPS1,EPS2,EPSM,
16     3 EPSM2,EPSN,EPSU,ERROR,EULST,FCIR,FX1,FX2,FX3,G,GAMMA,GMACH,
17     4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,H0NX,HLM,HM,HSM,HSTAG,
18     5 HUPX,P,PRG,PSTAG,QUEU,QUEH,R,RC,REP,RGAS,RHO,RH00NL,RHOST,RP,
19     6 RTH,STGMA,SIGX,SQRH,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
20     7 UG00,UG0DN,UG0UP,UG0NX,UG0PX,UP,UPO,UP0DN,UP0UP,UP0NX,UP0PX,UT,
21     8 WPGW,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
22     COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
23     1 UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
24     2 WORK(33),XDN(500),XTBL(500),XUP(500)
25     COMMON/COM04/ CAY1,CAY2,CAY3,CAYR,CUE0,CUE1,CUE2,CUE4,CUER,DY1LST,
26     1 EL0,EL1,EL2,EL4,GAMBAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,FL2MH,
27     2 UTPR,RPLST
28     COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN,
29     1 NTRY,NUP,NDEG,NPTS.
30     DATA DQNEW/1.0E+10/
31     DQMAX = 1.0E+10
32     NTRY=INTRY
33     GMACH=DSQRT(SQRH)
34
35     C
36     C ENSURE THAT THE STORED DATA DOES NOT EXCEED DIMENSIONS
37     C
38     C
39     13 N = N+ 1
40     IF (N.GE.500) GO TO 300
41     XTBL(N)=X
42     UGTBL(N)=UG
43     UPTBL(N)=UP
44     HTBL(N)=H
45     14 IF (IDBUG.NE.0) CALL OPUT
46
47     C
48     C IF MACH GT 1 WE HAVE AN EXACT SOLUTION
49     C
50     C
51     18 IF (1.01-SQRH)40,40,19
52     19 IF (KFLG2)22,20,24
53     20 KFLG2=-1
54     GO TO 38
55     22 KFLG2=1
56     DX0=DX
57     DETA=ETAG-ETAP
58     IF (DABS(EULST-DETA)-4.0)24,24,23
59     23 EULST=EPSU
60     EPSU=DETA
61
62     C
63     C MUST HAVE AT LEAST F(3) DATA POINTS

```

16170
16190
16200
16270
16280
16290
16300
16370
16380
16390
16400
16410
16430
16440
16450
16460


```

30      C      IF (N-K)38,38,241      16470
      24      IF (N-K)38,38,241      16480
      C      C      16490
      C      START BLOWUP OR DOWN DETERMINATION      16500
      C      DY(1) IS SOLUTION TO EQ. 2      16510
      C      DENOM IS (M**2 - 1) FROM EQ 2      16520
      C      GNUM IS NUMERATOR FROM EQ 2      16530
      C      C      16540
      C      C      16550
      C      IF DU/DX IS NEGATIVE BLOW DOWN      16560
      C      C      16570
31      241      IF (DY(1))32,2415,2415      16580
      C      C      16590
      C      FIND SLOPE OF DU/DX      16600
      C      C      16610
32      2415      IF ((X-XLST).EQ.0.0) GO TO 2416      16620
33      DIFFQ=(DY(1)-DY1LST)/(X-XLST)      16630
34      GO TO 2417      16640
35      2416      DIFFQ=0.0      16650
      C      C      16660
      C      IF SLOPE IS GT 7.5*10**7 BLOWUP      16670
      C      C      16680
36      2417      IF (DIFFQ-DQMAX)242,28,28      16690
      C      C      16700
      C      IF SLOPE LT -10**10 BLOW DOWN      16710
      C      C      16720
37      242      IF (-DQNEW-DIFFQ) 25,32,32      16730
      C      C      16740
      C      IF DENOM HAS CHANGED SIGN CHECK SOME MORE, IF NOT GO TO 30      16750
      C      C      16760
38      25      IF (DENOM*DNLST)26,26,30      16770
      C      C      16780
      C      IF NUM CHANGED SIGN---EXACT, IF NOT BLOW UP      16790
      C      C      16800
39      26      IF (GNUM*GNLST)40,40,28      16810
40      28      BLOW=1      16820
41      DNLST = DENOM      16830
42      GNLST = GNUM      16840
43      DY1LST = DY(1)      16850
44      XLST = X      16860
45      GO TO 42      16870
      C      C      16880
      C      CHECK NUMERATOR SIGN CHANGE, IF IT HAS CHANGED BLOWDOWN,      16890
      C      IF IT HASNT GO TO 36 AND CHECK SOME MORE      16900
      C      C      16910
46      30      IF (GNUM*GNLST)32,32,36      16920
47      32      BLOW=-1      16930
48      DNLST = DENOM      16940
49      GNLST = GNUM      16950
50      DY1LST = DY(1)      16960
51      XLST = X      16970
52      IF (X.GE.XT) GO TO 42      16980
      C      C      16990
      C      IN CERTAIN CASES OSCILLATIONS WILL OCCUR AND ERRONEOUS BLOWUP OR D      17000
      C      INDICATIONS WILL RESULT. IN ALL INSTANCES THE CALCULATED MACH NUMB      17010

```

	C	SHOULD NOT BE GREATER THAN AN EQUIVALENT ISENTROPIC MACH NUMBER	17020
	C	FOR A BLOW DOWN SOLUTION.	17030
	C	MACHR DETERMINES THE ISENTROPIC MACH NUMBER AND THE FOLLOWING	17040
	C	STATEMENT CHECKS THE RESULTS.	17050
	C		17060
53		CALL MACHR(R,RTH,GAMMA,TMACH,GMACH)	17070
54		IF (GMACH,GT,TMACH) BLOW=1.0	
55		GO TO 42	17090
	C		17100
	C	IF DU/DX GT.10**10 BLOW UP. IF NOT RESET AND RETRY.	17110
	C		17120
56	36	IF (DY(1)-DUMAX)38,28,28	17130
57	38	ONLST=DENOM	17140
58		GNLST=GNUM	17150
59		DY1LST=DY(1)	17160
60		XLST=X	17170
61		GO TO 50	17180
62	42	IF (LFLAG)40,46,40	17190
63	40	BLOW=0	17200
64		IF (SQRM.GT.1.0.AND.X.LT.XT) BLOW = 1.0	17210
65		IF (IDBUG,EA.0) GO TO 46	
66		WRITE (6,302)	17220
67		WRITE (6,303) R,RTH,GAMMA,TMACH,GMACH	17230
68	302	FORMAT (5X,23HR,RTH,GAMMA,TMACH,GMACH)	17240
69	303	FORMAT (5X,5(1F10.7,5X))	17250
70	46	INTRY=2	17260
71		INTRY=INTRY	17270
72	50	RETURN	
73	300	WRITE (6,301)	17330
74	301	FORMAT(' EXCEEDED 500 ITERATIONS IN CTRL1 OF IDNOZ MODULE')	
75		STOP	
76		END	17360

SYMBOL		REFERENCES							
13	-	13*							
14	-	19*							
18	-	20*							
19	-	20	21*						
20	-	21	22*						
22	-	21	24*						
23	-	27	28*						
24	-	21	27	30*					
25	-	37	38*						
26	-	38	39*						
28	-	36	34	40*	56				
30	-	38	46*						
32	-	31	37	46	47*				
36	-	46	56*						
J8	-	23	30	56	57*				
40	-	20	39	62	63*				
42	-	45	52	55	62*				
46	-	62	65	70*					
50	-	61	72*						
241	-	30	31*						
242	-	36	37*						
300	-	14	73*						
301	-	73WR	74*						
302	-	66WR	68*						
303	-	67WR	69*						
2415	-	31	32*						
2416	-	32	35*						
2417	-	34	36*						
ALPHA	-	5C0							
ARF	-	4C0							
ATARL	-	6C0							
BLOW	-	5C0	40=	47=	54=	63=	64=		
CAYR	-	7C0							
CAY1	-	7C0							
CAY2	-	7C0							
CAY4	-	7C0							
CHLN	-	4C0							
CNST1	-	5C0							
CNST10	-	5C0							
CNST2	-	5C0							
CNST3	-	5C0							
CNST4	-	5C0							
CNST5	-	5C0							
CNST6	-	5C0							
CNST7	-	5C0							
CNST8	-	5C0							
CNST9	-	5C0							
* COM01	-	4*							
* COM02	-	5*							
* COM03	-	6*							
* COM04	-	7*							
* COM05	-	8*							
CPCG	-	5C0							

I N D E X

SUBROUTINE CTRL1 (INTRY)

PAGE 24R

CPG	-	500						
CPL	-	500						
CPP	-	500						
CPS	-	500						
* CTRL1	-	1*						
CUER	-	700						
CUE0	-	700						
CUE1	-	700						
CUE2	-	700						
CUE4	-	700						
CUGO	-	400						
* UABS	-	27						
DELU	-	500						
DENOM	-	500	38	41	48	57		
DETA	-	26=	27	29				
DIFFQ	-	300	33=	35=	36	37		
DMOND	-	500						
DMONU	-	500						
DNLST	-	500	38	41=	48=	57=		
DOMAX	-	500	10=	36				
DONEW	-	90A	37					
* DSQRT	-	12						
DUMAX	-	500	56					
DX	-	500	25					
DX0	-	500	25=					
DY	-	600	31	33	43	50	56	59
DY1LST	-	700	33	43=	50=	59=		
EL0	-	700						
EL1	-	700						
EL2	-	700						
EL2MH	-	700						
EL4	-	700						
EPSM	-	500						
EPSM2	-	500						
EPSM	-	500						
EPSU	-	500	28	29=				
EPS1	-	500						
EPS2	-	500						
ERROR	-	500						
ETAG	-	500	26					
ETAP	-	500	26					
EULST	-	500	27	28=				
EXEN	-	400						
FCTR	-	500						
FX1	-	500						
FX2	-	500						
FX3	-	500						
G	-	500						
GAMRAR	-	700						
GAMMA	-	500	53AG	67WR				
GMACH	-	500	12=	53AG	54	67WR		
GMSSP	-	500						
GMUG	-	500						
GMUS	-	500						
GNLST	-	500	39	42=	46	49=	58=	

I N D E X

SUBROUTINE CTRL1(INTRY)

PAGE 249

GNUM	-	5C0	39	42	46	49	58
H	-	5C0	18				
HON	-	6C0					
HONX	-	5C0					
HLM	-	5C0					
HM	-	5C0					
HSM	-	5C0					
HSTAG	-	5C0					
HTHL	-	6C0	18=				
HUP	-	6C0					
HUPX	-	5C0					
HQ	-	5C0					
HOD	-	5C0					
HOU	-	5C0					
IDBUG	-	4C0	19	65			
IDNPR1	-	4C0					
IERK	-	8C0					
INTRY	-	1A6	11	70=	71		
K	-	8C0	30				
KFLG1	-	8C0					
KFLG2	-	8C0	21	22=	24=		
KFLG3	-	8C0					
KFLG4	-	8C0					
LFLAG	-	8C0	62				
LINF5	-	8C0					
* MACHR	-	53*					
N	-	8C0	13=	14	15	16	17
NDEG	-	8C0					18
NON	-	8C0					30
NOZTYP	-	4C0					
NPTS	-	8C0					
NTRY	-	8C0	11=	71=			
NUP	-	8C0					
* OPUT	-	19*					
P	-	5C0					
PARWT	-	4C0					
PRG	-	5C0					
* PRINT	-	3*					
PROP	-	4C0					
PSTAG	-	5C0					
QUAN1	-	7C0					
QUAN2	-	7C0					
QUAN3	-	7C0					
QUAN4	-	7C0					
QUAN5	-	7C0					
QUED	-	5C0					
QUEH	-	5C0					
R	-	5C0	53A6	67WR			
RARC1	-	4C0					
RAKC2	-	4C0					
RC	-	5C0					
RCH	-	4C0					
RFP	-	5C0					
* RETURN	-	72*					
RGAS	-	5C0					

2-250

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RHO	-	500																		
RHOST	-	500																		
RH00NL	-	500																		
RP	-	500																		
RPLST	-	700																		
RTAHL	-	600																		
RTH	-	500	53AG	67WR																
SIGMA	-	500																		
SIGX	-	500																		
SLOP1	-	400																		
SLOP2	-	400																		
SORM	-	500	12	20	64															
STOP	-	750																		
TAU	-	500																		
TAUG	-	500																		
TERM1	-	300																		
TERM2	-	300																		
TEXTK	-	400																		
YG	-	500																		
TGU	-	500																		
TM	-	500																		
TMACH	-	53AG	54	67WR																
TP	-	500																		
TSTAG	-	500																		
TSTAGK	-	400																		
TT	-	500																		
UG	-	500	16																	
UGDN	-	600																		
UGDNX	-	500																		
UGTHL	-	600	16=																	
UGUP	-	600																		
UGUPX	-	500																		
UGU	-	500																		
UGDDN	-	500																		
UGDUP	-	500																		
UG00	-	500																		
UP	-	500	17																	
UPDN	-	600																		
UPDNX	-	500																		
UPTBL	-	600	17=																	
UPUP	-	600																		
UPUPX	-	500																		
UP0	-	500																		
UPDDN	-	500																		
UPDUP	-	500																		
UT	-	500																		
UTPR	-	700																		
U0	-	500																		
WORK	-	600																		
WPWG	-	500																		
WTMOL6	-	400																		
X	-	500	15	32	33	44	51	52	60	64										
XDN	-	600																		
XF	-	500																		
XLST	-	300	32	33	44=	51=	60=													

INDEX

SUBROUTINE CTRL1(INTRY)

PAGE 251

XMAX	-	5C0		
XT	-	5C0	52	64
XTBL	-	6C0	15	
XUP	-	6C0		
XX	-	5C0		
X0	-	5C0		
X00	-	5C0		
X1	-	5C0		
X2	-	5C0		
X3	-	5C0		

1	SUBROUTINE CTRL2(INTRY)	17380
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	DIMENSION TDY(3)	17390
4	COMMON /CDX4/ DX4	17710
5	COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4, 1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPP,CPS, 2 DELU,DENOM,DMOND,DMONU,ONLST,DQMAX,DUMAX,DX,DX0,EPS1,EPS2,EPSM, 3 EPSM2,EPSN,EPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH, 4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,HDNX,HLN,HM,HSN,HSTAG, 5 HUPX,P,PRG,PSIAG,QUEQ,QUEH,R,RC,REP,REGAS,RHO,RHOONL,RHOST,RP, 6 RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,FM,TP,TSTAG,TT,U0,UG,UG0, 7 UG00,UG0DN,UG0UP,UGDNX,UGUPX,UP,UP0,UP0DN,UP0UP,UPDNX,UPUPX,UT, 8 WPWG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3), 1 UGDN(500),UGTRL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500), 2 WORK(33),XDN(500),XTBL(500),XUP(500) COMMON/COM04/ CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUE2,CUE4,CUER,DY1LST, 1 EL0,EL1,EL2,EL4,GAMBAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,FL2MH, 2 UTPR,RPLST COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN, 1 NTRY,NUP,NDEG,NPTS NTRY=INTRY TDY(3) = TDY(2) TDY(2) = TDY(1) TDY(1) = DY(1) CALL OPUT GMACH=DSQRT(SORM) IF (GMACH.LT.0.94) GO TO 200 DO 100 I=1,3 DO 110 J=1,3 CHECK =0ABS(TDY(I)-TDY(J)) IF (CHECK.GT.1.0) GO TO 200 110 CONTINUE 100 CONTINUE BLOW = 0.0 200 CONTINUE IF (KFLG4) 26,17,26 IF (UG) 28,18,18 TOGO=XX-X IF (TOGO) 26,26,19 19 DUMMY=(DX+X)-X IF (DUMMY) 26,26,20 20 IF (TOGO-DX) 22,22,24 22 DX =TOGO 24 RETURN 26 CONTINUE INTRY=2 NTRY=INTRY DY1LST=DY(1) RETURN 28 WRITE(6,29) UG 29 FORMAT(' UG IS LESS THAN ZERO IN CTRL2 OF IDNO7 MODULE',/,' UG=',E15 \$,8) STOP END	17940 17970 17980 17990 18000 18020 18030 18040 18060 18070 18080 18090 18100 18110 18120 18130 18140 18160 18170 18180 18200 18210 18220 18200 18210 18220 18240

17940
17970
17980
17990
18000
18020
18030
18040
18060
18070
18080
18090
18100
18110
18120
18130
18140
18160
18170
18180

18200
18210
18220
18240

SYMBOL	-----	REFERENCES	-----
17	- 24	25*	
18	- 25	26*	
19	- 27	28*	
20	- 29	30*	
22	- 30	31*	
24	- 30	32*	
26	- 24	27	29 33*
28	- 25	38*	
29	- 38WR	39*	
100	- 1600	21*	
110	- 1700	20*	
200	- 15	19	23*
ALPHA	- 5C0		
ATARI	- 6C0		
BLOW	- 5C0	22=	
CAYR	- 7C0		
CAY1	- 7C0		
CAY2	- 7C0		
CAY4	- 7C0		
* CDX4	- 4*		
CHECK	- 18=	19	
CNST1	- 5C0		
CNST10	- 5C0		
CNST2	- 5C0		
CNST3	- 5C0		
CNST4	- 5C0		
CNST5	- 5C0		
CNST6	- 5C0		
CNST7	- 5C0		
CNST8	- 5C0		
CNST9	- 5C0		
* COM02	- 5*		
* COM03	- 6*		
* COM04	- 7*		
* COM05	- 8*		
CPCG	- 5C0		
CPG	- 5C0		
CPL	- 5C0		
CPP	- 5C0		
CPS	- 5C0		
* CTRL2	- 1*		
CUER	- 7C0		
CUE0	- 7C0		
CUE1	- 7C0		
CUE2	- 7C0		
CUE4	- 7C0		
* DABS	- 18		
DELU	- 5C0		
DENOM	- 5C0		
DMOND	- 5C0		
DMONU	- 5C0		
DNLST	- 5C0		
DMAX	- 5C0		

I N D E X

SUBROUTINE CTRL2(INTRY)

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#	DSORT	-	14				
	DUMAX	-	500				
	DUMMY	-	28=	29			
	DX	-	500	30	31=		
	DX0	-	500				
	DX4	-	400	28			
	DY	-	600	12	36		
	DY11ST	-	700	36=			
	EL0	-	700				
	EL1	-	700				
	EL2	-	700				
	EL2MH	-	700				
	EL4	-	700				
	EPSM	-	500				
	EPSM2	-	500				
	EPSN	-	500				
	EPSU	-	500				
	EPS1	-	500				
	EPS2	-	500				
	ERROR	-	500				
	ETAG	-	500				
	ETAP	-	500				
	EULST	-	500				
	FCTR	-	500				
	FX1	-	500				
	FX2	-	500				
	FX3	-	500				
	G	-	500				
	GAMBAR	-	700				
	GAMMA	-	500				
	GMACH	-	500	14=	15		
	GMSSP	-	500				
	GMUG	-	500				
	GMUS	-	500				
	GNLST	-	500				
	GNUM	-	500				
	H	-	500				
	H0N	-	600				
	H0NX	-	500				
	HLM	-	500				
	HM	-	500				
	HSM	-	500				
	HSTAG	-	500				
	HTBL	-	600				
	HUP	-	600				
	HUPX	-	500				
	H0	-	500				
	H0D	-	500				
	H0U	-	500				
	I	-	1600	18			
	IERR	-	800				
	INTRY	-	1AG	9	34=	35	
	J	-	1700	18			
	K	-	800				
	KFLG1	-	800				

I N D E X

SURROUTINE CTRL2(INTRY)

PAGE 255

KFLG2	-	800				
KFLG3	-	800				
KFLG4	-	800	24			
LFLAG	-	800				
LINFS	-	800				
N	-	800				
NDFG	-	800				
NON	-	800				
NPTS	-	800				
NTRY	-	800	9=	35=		
NUP	-	800				
* OPUT	-	13*				
P	-	500				
PRG	-	500				
PSTAG	-	500				
QUAN1	-	700				
QUAN2	-	700				
QUAN3	-	700				
QUAN4	-	700				
QUAN5	-	700				
QUED	-	500				
QUEH	-	500				
R	-	500				
RC	-	500				
REP	-	500				
* RETURN	-	32*	37*			
RGAS	-	500				
RHO	-	500				
RHOST	-	500				
RH00NL	-	500				
RP	-	500				
RPLST	-	700				
RTARL	-	600				
RTH	-	500				
SIGMA	-	500				
SIGX	-	500				
SORM	-	500	14			
* STOP	-	40*				
TAU	-	500				
TAUG	-	500				
TDY	-	301	10=	11=	12=	18
TG	-	500				
TG0	-	500				
TM	-	500				
TOG0	-	26=	27	30	31	
TP	-	500				
TSTAG	-	500				
TT	-	500				
UG	-	500	25	38WR		
UGDN	-	600				
UGDNX	-	500				
UGTRL	-	600				
UGUP	-	600				
UGUPX	-	500				
UG0	-	500				

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I N D E X

SUBROUTINE CTRL2(INTRY)

PAGE 256

UGODN - 5C0
UGOUP - 5C0
UGOD - 5C0
UP - 5C0
UPDN - 6C0
UPDNX - 5C0
UPTBL - 6C0
UPUP - 6C0
UPUPX - 5C0
UPD - 5C0
UPDDN - 5C0
UPDUP - 5C0
UT - 5C0
UTPR - 7C0
U0 - 5C0
WORK - 6C0
WPWG - 5C0
X - 5C0 26 28
XDN - 6C0
XF - 5C0
XMAX - 5C0
XT - 5C0
XTBL - 6C0
XUP - 6C0
XX - 5C0 26
X0 - 5C0
X00 - 5C0
X1 - 5C0
X2 - 5C0
X3 - 5C0

```

1      SUBROUTINE DERIV
2      IMPLICIT REAL*8 (A-H,O-Z)
3      COMMON/PRINT/TERM1,TERM2,DIFF0,XLST
4      COMMON/COM01/TSTAGK,TEXTK,CHEN,EXEN,PROP,WTMOLG,CUGO,
5      1 PARWT,RCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,INRUG,IDHPRT
6      DIMENSION UGSAV(2)
7      COMMON /BOR/ KFLG
8      COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
9      1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPH,CPS,
10     2 DELU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EPS1,FPS2,EPSM,
11     3 EPSM2,EPSN,EPSU,EPROR,FULST,FCTR,FX1,FX2,FX3,G,GAMMA,GHACH,
12     4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,H0NX,HLM,HM,HSM,HSTAG,
13     5 HUPX,P,PRG,PSTAG,QUEH,QUEH,R,RC,REP,RGAS,RHO,RH0NL,RHOST,RP,
14     6 RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
15     7 UG00,UG0DN,UG0UP,UG0NX,UG0PX,UP,UP0,UP0DN,UP0UP,UP0NX,UP0PX,UT,
16     8 WPWG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
17     COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
18     1 UGDN(500),UGTRL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
19     2 WORK(33),XDN(500),XTBL(500),XUP(500)
20     COMMON/COM04/ CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUE2,CUE4,CUE5,CUE6,CUE7,
21     1 ELO,EL1,EL2,EL4,GAMBAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,FL2MH,
22     2 UTPR,RPLST
23     COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NON,
24     1 NTRY,NUP,NDEG,NPTS
25     DATA TEST/-180,218/
26     LFLAG=0
27     UG=UG0+ETAG
28     UP=UG0+ETAP
29     IF (UG.LT.0.0 .OR. UP.LT.0.0 ) GO TO 50
30     IF (N.LT.600) GO TO 130
31     GO TO (100,200),KFLG
32     100 IF (((1.01*UG)-UGSAV(2)).LT.0.0) KFLG = 2
33     120 UGSAV(1) = UGSAV(2)
34     130 UGSAV(2) = UG
35     130 CONTINUE
36     10 UGSO=UG*UG
37     TAUG=(-0.5*UGSO-WPWG*(H-HSTAG +0.5*UP*UP))/CPG
38     TG=TSTAG+TAUG
39     IF (TG.LT.0.0) GO TO 70
40     TGSAV = TG
41     C
42     C DETERMINE VISCOSITY AND PRODUCT OF GAMMA*R*T
43     C
44     15 GMUG=GMUS*(TG/TSTAG)**ALPHA
45     GRT=CNST5*TG
46     C
47     C LKUP FINDS LOCAL RADIUS
48     C
49     GO TO (16,17),NOZTYP
50     16 CALL CONICL (X,R,RPR,RDBLP,2)
51     GO TO 18
52     17 CALL LKUP(X,R,RPR,RDBLP,2)
53     18 CONTINUE
54     IF (PSTAG)21,20,21
55     20 QUEH=1.0

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13930

14000

14320

14340

14350

14360

14370

14400

14410

14420

14430

14440

14450

14460

14470

14480

14490

14530

14540

14550

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14570

14580

14590

14600

14610

14620

14640

14650

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ORIGINAL PAGE IS
OF POOR QUALITY

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36 202 QUED=1.0 14660
37 GO TO 24 14670
C 14680
C EIND PRESSURE AND DENSITY 14690
C 14700
38 21 P=CNST9*UG00/UG*TG/TG0*(RC/R)**2 14710
39 RHO=4633.056/RGAS*P/TG 14720
40 ARDV=DABS(UG-UP)
C 14740
C FIND REYNOLDS NUMBER 14750
C 14760
41 REP=2.0*ARDV*RP*RHO/GMUG
42 GMP=ARDV/DSQRT(GRT)
43 IF (REP-0.00001) 20,20,22 14790
C 14800
C EQUATION 9 14810
C 14820
44 22 Z=2.0+0.459*REP**0.55 14830
45 QUEH=Z/(2.0+6.84*GMP*Z/REP) 14840
46 IF (GMP-0.00001) 202,202,23 14850
C 14860
C EQUATION 8 14870
C 14880
47 23 ARG1=-0.427/GMP**4.63-3.0/REP**0.88 14890
48 ARG2=-1.25*REP/GMP 14900
49 ARG3= 1.0 +0.15*REP**0.687 14910
50 ARG4= 1.0 +3.82*GMP/REP 14920
51 IF (ARG1.GT.TEST.AND.ARG2.GT.TEST) GO TO 2353 14930
52 IF (ARG1.LT.TEST.AND.ARG2.LT.TEST) GO TO 2350 14940
53 IF (ARG1.LT.TEST.AND.ARG2.GT.TEST) GO TO 2351 14950
54 IF (ARG1.GT.TEST.AND.ARG2.LT.TEST) GO TO 2352 14960
55 WRITE(6,500) ARG1,ARG2,GMP,REP 14970
56 500 FORMAT('OERROR IN DERIV',/, ARG1=,E15.8,/, ARG2=,E15.8,/, GMP=,
$E15.8,/, REP=,E15.8) 14980
57 GO TO 202 14990
58 2350 QUED= ARG3/ARG4 15000
59 GO TO 2400 15010
60 2351 QUED= ARG3/(1.0+(3.82+1.28*DEXP(ARG2))*GMP/REP) 15020
61 GO TO 2400 15040
62 2352 QUED= ARG3*(1.0+DEXP(ARG1))/ARG4
63 GO TO 2400 15060
64 2353 QUED= ARG3*(1.0+DEXP(ARG1))/(1.0+(3.82+1.28*DEXP(ARG2))*GMP/REP)
65 2400 CONTINUE 15080
66 24 FCTR=CNST2*GMUG/UP 15090
67 DY(2)=1.5*QUED*(ETAG-ETAP)*FCTR 15100
68 IF (HLM-H) 25,27,26 15110
69 25 TP=TM*(H-HLM)/CPL 15120
70 GO TO 285 15130
71 26 IF (HSM-H) 27,27,28 15140
72 27 TP=TM 15150
73 GO TO 285 15160
74 28 TP=TM*(H-HSM)/CPS 15170
75 285 TAU=TP-TSTAG 15180
76 DY(3)=CNST3*QUEH*(TAUG-TAU)*FCTR 15190
77 TERM1=2.0*UG*RRP/R 15200

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18      TERM2=WPWG*(DY(3)/CPG -(UG-CNST4*UP)*DY(2)/RGAS)*UG/TG      15210
19      SQRM=UGSQ/GRT      15220
20      DENOM=SQRM-1.0      15230
21      GNUM=TERM2+TERM1      15240
22      IF (DENOM+FPSM) 34,29,29      15250
23      29 IF (DENOM-4.0*EPSM) 30,30,34      15260
24      30 IF (KFLG3) 31,305,31      15270
25      305 IF (DABS(GNUM/TERM1)-EPSN) 31,31,32
26      31 IF (DY1LST-1,E+38) 315,316,316      15290
27      315 DY(1)=DY1LST      15300
28      316 LFLAG = 1      15310
29      RETURN      15320
30      32 IF (DENOM) 34,31,34      15330
31      34 DY(1)=GNUM/DENOM      15340
32      IF (DY(1)) 38,36,36      15350
33      RETURN      15360
34      38 IF (DUMAX+DY(1)) 40,40,36      15370
35      40 IF (DY1LST-1,E+38) 315,42,42      15380
36      42 IF (DENOM) 36,44,44      15390
37      44 DY(1)=DUMAX      15400
38      RETURN      15410
39      C      15420
40      C      THIS SET OF EQUATIONS WILL ATTEMPT TO BAIL OUT THE SOLUTION      15430
41      C      IN THE EVENT OF LARGE OSCILLATIONS WHICH MIGHT CAUSE NEGATIVE      15440
42      C      VELOCITIES OR TEMPERATURES.      15450
43      C      15460
44      50 UG = (UGSAV(1) + UGSAV(2))/2.0      15470
45      UP = 0.99*UG      15480
46      ETAG = UG-UG0      15490
47      ETAP = UP-UG0      15500
48      IF (IDNPRT.EQ.0) GO TO 10
49      WRITE (6,60) UG,UP      15510
50      60 FORMAT (5X,29HWARNING NEG VEL,FIXED VEL ARE, 2F10.2)      15520
51      GO TO 10      15530
52      70 TG = 0.95*TGSAV      15540
53      IF (IDNPRT.EQ.0) GO TO 15
54      WRITE (6,83) TG      15550
55      83 FORMAT (5X,20HWARNING NEG TEMP,TG=,1F10.2)      15560
56      WRITE (6,300) N,NDN,X,DX      15570
57      GO TO 15      15580
58      200 IF ((UG+0.1).GT.UGSAV(2).AND. (UG-0.1).LT.UGSAV(1)) GO TO 130      15590
59      UGFIX1=DABS(UG-UGSAV(1))
60      UGFIX2=DABS(UG-UGSAV(2))
61      UGSLOP = UGSAV(1)-UGSAV(2)      15620
62      IF (UGFIX1-UGFIX2) 210,240,270      15630
63      210 UG = UGSAV(1)-0.1*UGSLOP      15640
64      UGSAV(1) = UG      15650
65      ETAG = UG - UG0      15660
66      GO TO 130      15670
67      270 UG = UGSAV(2)+0.1*UGSLOP      15680
68      UGSAV(2) = UG      15690
69      ETAG = UG - UG0      15700
70      GO TO 130      15710
71      240 UG = (UGSAV(1)+UGSAV(2))/2.0      15720
72      ETAG = UG - UG0      15730

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SUBROUTINE DERIV

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128      GO TO 130
129      300 FORMAT (5X,10HN NDN X DX,2(1110,5X),2(1F15,10,5X))
130      END

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15740
15750
15760

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SYMBOL	REFERENCES
10	22* 103 106
15	27* 108 112
16	29 30*
17	29 32*
18	31 33*
20	34 35* 43
21	34 38*
22	43 44*
23	46 47*
24	37 66*
25	68 69*
26	68 71*
27	68 71 72*
28	71 74*
29	82 83*
30	83 84*
31	84 85 86* 90
32	85 90*
34	82 83 90 91*
36	92 93* 94 96
38	92 94*
40	94 95*
42	95 96*
44	96 97*
50	15 99*
60	104WR 105*
70	25 107*
81	109WR 110*
100	17 18*
120	19*
130	16 21* 113 121 125 128
200	17 113*
202	36* 46 57
210	117 118*
240	117 126*
270	117 122*
285	70 73 75*
300	111WR 129*
305	84 85*
315	86 87* 95
316	86 88*
500	55WR 56*
2350	52 58*
2351	53 60*
2352	54 62*
2353	51 64*
2400	59 61 63 65*
ABDV	40= 41 42
ALPHA	7C0 27
ARF	4C0
ARG1	47= 51 52 53 54 55WR 62 64
ARG2	48= 51 52 53 54 55WR 60 64
ARG3	49= 58 60 62 64

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I N D E X

SUBROUTINE DERIV

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EL2MH	-	9CO									
EL4	-	9CO									
EPSM	-	7CO	82	83							
EPSM2	-	7CO									
EPSN	-	7CO	85								
EPSU	-	7CO									
EPS1	-	7CO									
EPS2	-	7CO									
ERROR	-	7CO									
ETAG	-	7CO	13	67	101=	120=	124=	127=			
ETAP	-	7CO	14	67	102=						
EULST	-	7CO									
EXEN	-	4CO									
FCTR	-	7CO	66=	67	76						
FX1	-	7CO									
FX2	-	7CO									
FX3	-	7CO									
G	-	7CO									
GAMBAR	-	9CO									
GAMMA	-	7CO									
GMACH	-	7CO									
GMP	-	42=	45	46	47	48	50	55WR	60	64	
GMSSP	-	7CO									
GMUG	-	7CO	27=	41	66						
GMUS	-	7CO	27								
GNLST	-	7CO									
GNUM	-	7CO	81=	85	91						
GRT	-	28=	42	79							
H	-	7CO	23	68	69	71	74				
HDN	-	8CO									
HDNX	-	7CO									
HLM	-	7CO	68	69							
HM	-	7CO									
HSM	-	7CO	71	74							
HSTAG	-	7CO	23								
HTBI	-	8CO									
HUP	-	8CO									
HUPX	-	7CO									
HQ	-	7CO									
HQD	-	7CO									
HQU	-	7CO									
IDBUG	-	4CO									
IDNPRT	-	4CO	103	108							
IERR	-	10CO									
K	-	10CO									
KFLG	-	6CO	17	18=							
KFLG1	-	10CO									
KFLG2	-	10CO									
KFLG3	-	10CO	84								
KFLG4	-	10CO									
LFLAG	-	10CO	12=	88=							
LINES	-	10CO									
LKUP	-	32*									
N	-	10CO	16	111WR							
NOEG	-	10CO									

I N D E X

SUBROUTINE DERIV

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		104WR	113	114	115	11A=	119	120	122=	123	124	126=	127	
UGDN	-	8C0												
UGDNX	-	7C0												
UGF IX1	-	114=	117											
UGF IX2	-	115=	117											
UGSAV	-	501	18	19=	20=	99	113	114	115	116	118	119=	122	123=
		126												
UGSLOP	-	116=	118	122										
UGSQ	-	22=	23	79										
UGTBL	-	8C0												
UGUP	-	8C0												
UGUPX	-	7C0												
UGO	-	7C0	13	14	101	102	120	124	127					
UGODN	-	7C0												
UGOUP	-	7C0												
UGOQ	-	7C0	38											
UP	-	7C0	14=	15	23	40	66	78	100=	102	104WR			
UPDN	-	8C0												
UPDNX	-	7C0												
UPTHL	-	8C0												
UPUP	-	8C0												
UPUPX	-	7C0												
UPQ	-	7C0												
UPQDN	-	7C0												
UPQUP	-	7C0												
UT	-	7C0												
UTPR	-	9C0												
UQ	-	7C0												
WORK	-	8C0												
WPWG	-	7C0	23	78										
WTMOLG	-	4C0												
X	-	7C0	30AG	32AG	111WR									
XDN	-	8C0												
XF	-	7C0												
XLST	-	3C0												
XMAX	-	7C0												
XT	-	7C0												
XTBL	-	8C0												
XUP	-	8C0												
XX	-	7C0												
X0	-	7C0												
X00	-	7C0												
X1	-	7C0												
X2	-	7C0												
X3	-	7C0												
Z	-	44=	45											

I N D E X

FUNCTION DRDX(Z)

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1	FUNCTION DRDX(Z)	8490
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN,	
	1 NTRY,NUP,NDEG,NPTS	
4	COMMON/COM06/ AOD,A(9),RL(200),XL(200),HDELT,RAMDER,RMDRK,AR,	
	1 RTHRT,XSAVE	
5	CALL GETAS(Z)	8550
6	FLJ=NDEG	8560
7	DRDX=FLJ*A(NDEG+1)	8570
8	J=NDEG	8580
9	DO 20 I=2,NDEG	8590
10	FLJ=FLJ-1.0	8600
11	DRDX=DRDX*Z*FLJ*A(J)	8610
12	J=J-1	8620
13	RETURN	8630
14	END	8640

20

SYMBOL		REFERENCES									
20	-	900	12*								
A	-	400	7	11							
A00	-	400									
AR	-	400									
* COM05	-	3*									
* COM06	-	4*									
* DRUX	-	1*	7=	11=							
FLJ	-	6=	7	10=	11						
* GETAS	-	5*									
HDELT	-	400									
I	-	900									
IERR	-	300									
J	-	8=	11	12=							
K	-	300									
KFLG1	-	300									
KFLG2	-	300									
KFLG3	-	300									
KFLG4	-	300									
LFLAG	-	300									
LINES	-	300									
N	-	300									
NDEG	-	300	6	7	8	900					
NDN	-	300									
NPTS	-	300									
NTRY	-	300									
NUP	-	300									
* RAMDER	-	400									
* RETURN	-	13*									
RL	-	400									
RMDRK	-	400									
RTHRT	-	400									
XL	-	400									
XSAVE	-	400									
Z	-	1AG	5AG	11							

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U256-10020-4

1	FUNCTION FOERP(RPART)	20930
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	COMMON/BLK006/RT01OF,RT01VF,RT01VT	
4	COMMON/COM01/TSTAGK,TEXTK,CHEN,EXEN,PROP,WIMOLG,CUGO,	
5	1 PARWT,KCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,IDBUG,IDNPRT	
6	EXTERNAL DERIV , CTRL1 , CTRL2	20970
7	DIMENSION Y(3)	
8	COMMON/CPRNT/CHANGF,THX,FR10,KPRNT	
9	COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,	
10	1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPP,CPS,	
11	2 DELU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EP51,FPS2,FPSM,	
12	3 EPSM2,EPSN,EPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,	
13	4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,H0NX,HLM,HM,HSM,HSTAG,	
14	5 HUPX,P,PRG,PSTAG,QUED,QUEH,R,RC,REP,RGAS,RHO,RH00NL,RHOST,RP,	
15	6 RTH,SIGMA,SIGX,SQRM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,	
16	7 UG00,UG0DN,UG0UP,UG0NX,UG0PX,UP,UP0,UP0DN,UP0UP,UP0NX,UP0PX,UT,	
17	8 WPG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX	
18	COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),	
19	1 UG0N(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),	
20	2 WORK(33),XDN(500),XTBL(500),XUP(500)	
21	COMMON/COM04/ CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUE2,CUE4,CUER,DY1LST,	
22	1 EL0,EL1,EL2,EL4,GAMBAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,EL2MH,	
23	2 UTPR,RPLST	
24	COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN,	
25	1 NTRY,NUP,NDEG,NPTS	
26	EQUIVALENCE (ETAG,Y(1)),(ETAP,Y(2)),(H,Y(3))	21280
27	NAMELIST/OUTPUT/CNST2,CNST3,CNST4,CNST5,CNST6,CNST7,QUAN1,QUAN2,	
28	\$QUAN3,QUAN4,CAY1,CAY2,CAYR,UT,TT,CAY4,CNST8,EL0,EL1,EL2,EL4,QUAN5,	
29	\$CUE0,CUE1,CUE2,CUER,CUE4,GAMBAR,CNST10,EL2MH,UTPR,UTNCR,CINIT,	
30	\$DISC,UGD	
31	NPASS=0	
32	RP=RPART	
33	109 REWIND 8	21310
34	REWIND 9	21320
35	ERROR=0.0	21330
36	LINES=0	21340
37	X0=0.0	21360
38	X1=-10001.0	21380
39	X2=-10001.0	21390
40	X3=X0	21400
41	DY1LST=1.E+38	21430
42	NLSW=1	21440
43	KFLG3=0	21450
44	CNST2=3.0/GMSSP/RP**2	
45	CNST3=CPG/PRG	21470
46	CNST4=1.0-1.0/GAMMA	21480
47	CNST5=GAMMA*RGAS	21490
48	CNST6=1.0/G/(WPG*1.0)	21500
49	CNST7=RGAS*CNST6	21510
50	QUAN1=1.0*WPG	21520
51	QUAN2=CPG+WPG*CPL	21530
52	QUAN3=CPG+WPG*CPS	21540
53	QUAN4=CPL/CPG	21550
54	CAY1=QUAN1/QUAN2	21560
55	CAY2=(1.0-WPG*(CNST5*CAY1*QUAN4+1.0))/CNST5	21570

39		CAYR=CAY2/CAY1	21540
40		UT=DSORT(TSTAG/(0.5*CAY1+CAY2))	
41		TT=TSTAG-0.5*CAY1*UT**2	21600
42		CAY4 =CAYR*DLOG(CAY2*UT**2)+DLOG(UT)	
43		CNST8=RTH**2*DFXP(CAY4-CAYR*DLOG(TSTAG))	
44		EL0=-QUAN2*(TM-TSTAG)/WPWG	21630
45		EL1=QUAN1/WPWG	21640
46		EL2=QUAN1*(1.0+CNST5/CPG)/CNST5/TM	21650
47		EL4= CAY4-CAYR*DLOG(TM)+EL2/CAY1*(TM-TSTAG)	
48		QUAN5=EL0+HLH-HSH	21670
49		CUE0=WPWG*QUAN5/QUAN3+TM	21680
50		CUE1=QUAN1/QUAN3	21690
51		CUE2=(1.0+WPWG*(CNST5*CUE1*CPS/CPG+1.0))/CNST5	21700
52		CUER=CUE2/CUE1	21710
53		CUE4= EL4+EL2/EL1*QUAN5+CUER*DLOG(CUE0-CUE1/EL1*QUAN5)	
54		GAMBAR=QUAN2/(CPG+GAMMA*WPWG*CPL)*GAMMA	21730
55		CNST10=GAMBAR/(GAMBAR-1.0)	21740
56		EL2MH= 1.0/DSORT(EL2)	
57		UTPR=DSORT(CUE0/(0.5*CUE1+CUE2))	
58		CALL CONST (0)	21770
59		UINCR=0.5*EPS1	21780
60		DELU2=4.0	21790
61		IF (RP=RPLST)13,12,13	
62	12	UG0=UZERO	21810
63		DELU=EPS1	21820
64		EPSU=EPSU2	21830
65		GO TO 18	21840
66	13	CINIT=UT*(RTH/RC)**2*(CAY2*UT**2/TSTAG)**CAYR	21850
67		DISC=1.0-2.0*CINIT**2*CAY2 /TSTAG	21860
68		IF (DISC)14,14,15	21870
69	14	UG0=2000.0	21880
70		DELU=500.0	21890
71		GO TO 16	21900
72	15	UG0=(1.0-DSORT(DISC))*TSTAG/CINIT/CAY2	
73		DELU = 0.1*UG0	21920
74	16	EPSU=0.0	21930
75		IF (IDNPRT.NE.0) WRITE(6,OUTPUT)	
	C		21940
	C	START VELOCITY CALCULATIONS	21950
	C		21960
76	18	KFLG1=0	21970
77	19	X=X0	21980
78		UG00=UG0	21990
79		ETAG=0.0	22000
80		ETAP=-EPSU	22010
81		UP0=UG0+ETAP	22020
82		IF (UP0)1903,1903,1905	22030
83	1903	ETAP=-UG0*.01	22040
84		UP0=0.01	22050
85	1906	CALL CONST (0)	22060
86		TAU=-CNST1*(UG0**2+WPWG*UP0**2)	22070
87		TG0=TSTAG+TAU	22080
88		CNST9=PSTAG*(TG0/TSTAG)**CNST10	22090
89		IF (TG0-TM)191,191,192	22100
90	191	CALL CONST (1)	22110

91	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	22120
92	TG0=TSTAG+TAU	22130
93	CNST9=PSTAG*(TG0/TSTAG)**CNST10	22140
94	H=HM+CPP*(TG0-TM)	22150
95	IF ((TSTAG-TM)*(TG0-TM))193,193,194	22160
96	193 WRITE (6,1932)	22170
97	1932 FORMAT (75HOMELTING OCCURS IN THE CHAMBER. PROGRAM IS UNABLE TO HANDLE THIS SITUATION./' ERROR IN FOFRP OF IDNOZ MODULE')	22180
98	CALL EXIT	22200
99	194 KFLG2=0	22210
100	DX=DX0	22220
101	DX2 = DX0	22230
102	EULST=0,0	22240
103	N=0	22250
104	ISTAT = 194	22260
105	IF (IDBUG.EQ.0) GO TO 1941	
106	WRITE (6,3245) ISTAT	22270
107	WRITE (6,3060) UG0UP,UG0DN,EPSU,EULST,UG0,UP0,UG00,TAU,TG0,CNST9,H	22280
	1,DX,DX0,XX,XE,ETAG,ETAP,H0	22290
108	3245 FORMAT (5X,17HCALLING RKS4 FROM,115)	22300
	C	22310
	C .. CALL RKSF4 WITH INITIAL VELOCITY GUESS. DETERMINE WHETHER BLOWUP	22320
	C BLOWDOWN OR EXACT (BLOW=+1,-1,0)	22330
	C	22340
109	1941 CALL RKSF4 (DERIV,CIRL),Y,DY,ATABL,RTABL,WORK,X,DX,3,0,1,NTRY,IERR)	22350
110	IF (IDBUG.EQ.0) GO TO 1942	
111	WRITE (6,3246) BLOW	22360
112	3246 FORMAT (5X,6HBLOW =,1F10.5)	22370
113	1942 IF (BLOW)20,195,24	22380
114	195 X=X0	22390
115	ETAG=0,0	22400
116	ETAP=-EPSU	22410
117	UP0=UG0+ETAP	22420
118	IF (UP0)1953,1956,1956	22430
119	1953 ETAP=-UG0	22440
120	1956 CALL CONST (0)	22450
121	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	22460
122	TG0=TSTAG+TAU	22470
123	CNST9=PSTAG*(TG0/TSTAG)**CNST10	22480
124	IF (TG0-TM)196,196,197	22490
125	196 CALL CONST (1)	22500
126	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	22510
127	TG0=TSTAG+TAU	22520
128	CNST9=PSTAG*(TG0/TSTAG)**CNST10	22530
129	197 H=HM+CPP*(TG0-TM)	22540
130	IF ((TSTAG-TM)*(TG0-TM))193,193,52	22550
	C	22560
	C REPLACE OLD BLOWDOWN WITH NEW SOLUTION	22570
	C	22580
131	20 CALL REPLCE(1)	
132	IF (KFLG1)23,22,30	22600
133	22 KFLG1=-1	22610
	C	22620
	C INCREMENT TO TRY FOR A BLOWUP SOLUTION AND TO 19 TO TRY AGAIN	22630
	C	22640

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134      23 IF (UG0=50.0) 231,232,237      22650
135      231 UG0 = UG0*CU60
136      GO TO 19      22670
137      232 UG0 = UG0*DELU      22680
138      GO TO 19      22690
C      22700
C      REPLACE OLD BLOWUP WITH NEW BLOWUP SOLUTION      22710
C      22720

139      24 CALL REPLCE(2)
140      IF (KFLG1)30,26,27      22740
141      26 KFLG1=1      22750
C      22760
C      REDUCE INITIAL VELOCITY AND TRY FOR A BLOWDOWN SOLUTION      22770
C      22780
C      22790
142      27 UG0=UG0-DELU      22800
143      28 IF (UG0)29,29,19      22810
144      29 DELU=0.5*DELU      22820
145      UG0=UG0+DELU      22830
146      GO TO 28      22840
C      22850
C      WE NOW HAVE A BLOWUP AND A BLOWDOWN SOLUTION. THIS LOOP(30-32)
C      WILL GET INITIAL VELOCITIES WITHIN EPS1 OF EACH OTHER      22860
C      22870
C      22880
147      30 CONTINUE      22890
148      3005 IF (UG0UP-UG0DN-EPS1)301,301,302
149      301 IF (DABS(EPSU-EULST)-20.0)3015,3015,302
150      3015 IF (DABS((EPSU-EULST)/UP0)-.100) 321,321,302
151      302 X=X0      22920
C      22930
C      MOVE THE INITIAL VELOCITIES CLOSER AND ESTABLISH NEW CONSTANTS      22940
C      22950
C      22960
152      UG0=0.5*(UG0UP+UG0DN)      22970
153      UG00=UG0      22980
154      ETAG=0.0      22990
155      ETAP=-EPSU      23000
156      UP0=UG0+ETAP      23010
157      IF (UP0)3025,3025,303      23020
158      3025 ETAP=-UG0+.01      23030
159      UP0=0.01      23040
160      303 CALL CONST (0)      23050
161      TAU=-CNST1*(UG0**2+WPWG*UP0**2)      23060
162      TGO=TSTAG+TAU      23070
163      CNST9=PSTAG*(TGO/TSTAG)**CNST10      23080
164      IF (TGO-TM)304,304,305      23090
165      304 CALL CONST (1)      23100
166      TAU=-CNST1*(UG0**2+WPWG*UP0**2)      23110
167      TGO=TSTAG+TAU      23120
168      CNST9=PSTAG*(TGO/TSTAG)**CNST10      23130
169      305 H=HM+CPP*(TGO-TM)      23140
170      IF ((TSTAG-TM)*(TGO-TM))193,193,306      23150
171      306 KFLG2=0      23160
172      DX=DX0      23170
173      DX2 = DX0      23180
174      N=0      23190
175      ISTAT = 306

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176	IF (IDBUG, EQ, 0) GO TO 307	
177	WRITE (6, 3245) ISTAT	23200
178	WRITE (6, 3060) UG0UP, UG0DN, EPSU, EULST, UG0, UP0, UG00, TAU, T60, CNST9, H	23210
	1, DX, DX0, XX, XF, ETAG, ETAP, H0	23220
179	3060 FORMAT (6(2X, 1E15, 9)/6(2X, 1E15, 9)/6(2X, 1E15, 9))	23230
	C	23240
	C CALL RKSF4 TO DETERMINE IF NEW SOLUTION IS BLOWUP OR DOWN	23250
	C	23260
180	307 CALLRKSF4 (DERIV, CTRL1, Y, DY, ATABL, RTABL, WORK, X, DX, 3, 0, 1, NTRY, IERR)	23270
	C	23280
	C REPLACE APPROPRIATE SOLUTION WITH NEW VALUES AND GO BACK TO 30	23290
	C TO DETERMINE WHETHER INITIAL VELOCITIES ARE WITHIN EPS1 OF EACH OTH	23300
	C	23310
181	IF (IDBUG, EQ, 0) GO TO 308	
182	WRITE (6, 3246) BLOW	23320
183	308 IF (BLOW) 31, 195, 32	23330
184	31 CALL REPLCE (1)	
185	GO TO 30	23350
186	32 CALL REPLCE (2)	
187	GO TO 30	23370
	C	23380
	C SELECT EITHER BLOWUP OR DOWN SOLUTIONS	23390
	C	23400
188	321 FLAG=DY (1)	23410
189	X=X0	23420
190	IF (FLAG) 322, 322, 323	23430
191	322 UG0=UG0UP	23440
192	GO TO 324	23450
	C	23460
	C RECOMPUTE CONSTANTS	23470
	C	23480
193	323 UG0=UG0DN	23490
194	324 UG00=UG0	23500
195	ETAG=0.0	23510
196	ETAP=-EPSU	23520
197	UP0=UG0+ETAP	23530
198	IF (UP0) 3240, 3240, 3241	23540
199	3240 ETAP=-UG0+.01	23550
200	UP0=0.01	23560
201	3241 CALL CONST (0)	23570
202	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	23580
203	TG0=TSTAG+TAU	23590
204	CNST9=PTAG*(TG0/TSTAG)**CNST10	23600
205	IF (TG0-TM) 3242, 3242, 3243	23610
206	3242 CALL CONST (1)	23620
207	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	23630
208	TG0=TSTAG+TAU	23640
209	CNST9=PTAG*(TG0/TSTAG)**CNST10	23650
210	3243 H=HM+CPP*(TG0-TM)	23660
211	IF ((TSTAG-TM)*(TG0-TM)) 193, 193, 3244	23670
212	3244 KFLG2=0	23680
213	DX=DX0	23690
214	DX2 = DX0	23700
215	N=0	23710
216	ISTAT = 3244	23720

217	IF (IDBUG,EQ,0) GO TO 3247	
218	WRITE (6,3245) ISTAT	23730
219	WRITE (6,3060) UG0UP,UG0DN,EPSU,EULST,UG0,UP0,UG00,TAU,TG0,CNST9,H	23740
	I,DX,DX0,XX,XF,ETAG,ETAP,H0	23750
C		23760
C	CALL RKSF4 TO DETERMINE WHETHER SOLUTION STILL BLOWS UP OR DOWN	23770
C		23780
220	3247 CALLRKSF4 (DERIV,CTRL1,Y,DY,ATABL,RTABL,WORK,X,DX,3.0,1,NTRY,IERR)	23790
C		23800
C	IF IT DOES GO TO 33 IF NOT GO BACK TO 18 AND RETRY	23810
C		23820
221	IF (IDBUG,EQ,0) GO TO 3248	
222	WRITE (6,3246) BLOW	23830
223	3248 IF (BLOW)325,195,327	23840
224	325 IF (FLAG)329,329,326	23850
225	326 CALL REPLCE(1)	
226	GO TO 33	23870
227	327 IF (FLAG)328,328,329	23880
228	328 CALL REPLCE(2)	
229	GO TO 33	23900
230	329 DELU=DELU2	23910
231	DELU2=0.5*DELU2	23920
232	GO TO 18	23930
C		23940
C	ARE INITIAL LAGS WITHIN 4 FT/SEC OF EACH OTHER	23950
C		23960
233	33 IF (DABS(EPSU-EULST)-4.0)331,331,302	
234	331 UZERO=UG0	23980
235	EPSUZ=EPSU	23990
236	RPLST=RP	
C		24010
C	GETXX WILL FIND AN X SUCH THAT UGUP AND UGDN ARE WITHIN EPS2	24020
C		24030
237	CALL GETXX	24040
238	IF (ERROR)60,332,60	24050
C		24060
C	RESET INITIALS FOR INTEGRATION TO XX	24070
C		24080
239	332 X=X0	24090
240	UG0=0.5*(UG0UP+UG0DN)	24100
241	UG00=UG0	24110
242	ETAG=0.0	24120
243	ETAP=-EPSU	24130
244	UP0=UG0*ETAP	24140
245	IF (UP0)3325,333,333	24150
246	3325 ETAP=-UG0	24160
247	UP0=0.0	24170
248	333 CALL CONST (0)	24180
249	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	24190
250	TG0=TSTAG+TAU	24200
251	CNST9=PSTAG*(TG0/TSTAG)**CNST10	24210
252	IF (TG0-TM)334,334,335	24220
253	334 CALL CONST (1)	24230
254	TAU=-CNST1*(UG0**2+WPWG*UP0**2)	24240
255	TG0=TSTAG+TAU	24250

256		CNST9=PTAG*(TG0/TSTAG)**CNST10	24260
257	335	H=HM+CPP*(TG0-TM)	24270
258		IF ((TSTAG-TM)*(TG0-TM))193,193,336	24280
259	336	KFLG2=0	24290
260		DX=DX0	24300
261		DX2 = DX0	24310
262		N=0	24320
	C		24330
	C	KFLG3 INDICATES INTEGRATION TO A SPECIFIED POINT	24340
	C		24350
263	34	KFLG3=1	24360
264		ISTAT = 34	24370
265		IF (IDBUG,EQ,0) GO TO 341	
266		WRITE (6,3245) ISTAT	24380
267		WRITE (6,3060) UG0UP,UG0DN,EPSU,EULST,UG0*UP0,UG00,TAU,TG0,CNST9,H	24390
		1,DX,DX0,XX,XX,ETAG,ETAP,HQ	24400
	C		24410
	C	CALL RKSF4 AND INTEGRATE TO XX	24420
	C	CTRL2 WILL CAUSE OUTPUT	24430
	C		24440
268	341	CALLRKSF4 (DERIV,CTRL2,Y,DY,ATABL,RTABL,WORK,X,DX,3,0,1,NTRY,IERR)	24450
	C		24460
	C	IF SIZING RUN GO TO 60	24470
	C		24480
269		IF (IDBUG,EQ,0) GO TO 342	
270		WRITE (6,3246) BLOW	24490
271	342	IF (KFLG4)60,344,60	24500
	C		24510
	C	STORE VALUES AND RESUME INTEGRATION AT X=XX	24520
	C		24530
272	344	IF (BLOW)345,700,345	24540
273	700	CONTINUE	24550
274	345	KFLG3=0	24560
275		X0=XX	24570
276		UG0UP=UG0PX	24580
277		UG0DN=UG0NX	24590
278		UP0UP=UP0PX	24600
279		UP0DN=UP0NX	24610
280		H0U=H0PX	24620
281		H0D=H0NX	24630
282		IF (UG0UP-UG0DN) 800,899,899	24640
283	800	UG0UP=UG0NX	24650
284		UG0DN=UG0PX	24660
285		UP0UP=UP0NX	24670
286		UP0DN=UP0PX	24680
287		H0U=H0NX	24690
288		H0D=H0PX	24700
289	899	UDIFF=UG-UP	24710
290		TDIFF=TG-TP	24720
291	35	CALL INIT	24730
292		ISTAT = 35	24740
293		DX2 = DX	24750
294		IF (IDBUG,EQ,0) GO TO 351	
295		WRITE (6,3245) ISTAT	24760
296		WRITE (6,3060) UG0UP,UG0DN,EPSU,EULST,UG0*UP0,UG00,TAU,TG0,CNST9,H	24770

		1,DX,DX0,XX,XF,ETAG,ETAP,H0	24780
	C		24790
	C	INTEGRATE TO BLOWUP,BLOWDOWN, OR MACH GT 1.0	24800
	C		24810
297	C	351 CALLPKSF4(DERIV,CTRL1,Y,DY,ATABL,RTABL,WORK,X,DX,3,0,1,NTRY,IERR)	24820
	C		24830
	C	GO TO 38 IF BLOW UP---IF BLOWDOWN, REPLACE BLOWDOWN SOLUTION	24840
	C	AND SET INITIAL CONDITIONS TO INTERPOLATED VALUES	24850
	C		24860
298		IF(IDBUG.EQ.0) GO TO 352	
299		WRITE (6,3246) BLOW	24870
300		352 IF (HLOW)36,50,38	24880
301		36 CALL REPLCE(1)	
302	362	X=X0	24900
303		UG0=UG0UP	24910
304		UP0=UP0UP	24920
305		H0=H0U	24930
306		ETAG=0.0	24940
307		ETAP=UP0-UG0	24950
308		H=H0	24960
309		KFLG2=0	24970
310		DX=DX0	24980
311		DX2 = DX0	24990
312		N=0	25000
313		ISTAT = 362	25010
314		IF(IDBUG.EQ.0) GO TO 3621	
315		WRITE (6,3245) ISTAT	25020
316		WRITE (6,3060) UG0UP,UG0DN,FPSU,EULST,UG0,UP0,UG00,TAU,T60,CNST9,H	25030
		1,DX,DX0,XX,XF,ETAG,ETAP,H0	25040
	C		25050
	C	INTEGRATE TO BLOWUP OR BLOWDOWN	25060
	C		25070
317	C	3621 CALLPKSF4(DERIV,CTRL1,Y,DY,ATABL,RTABL,WORK,X,DX,3,0,1,NTRY,IERR)	25080
318		IF(IDBUG.EQ.0) GO TO 3622	
319		WRITE (6,3246) BLOW	25090
	C		25100
	C	IF IT STILL BLOWS DOWN INCREASE UNTIL IT BLOWS UP	25110
	C		25120
320		3622 IF (BLOW)368,50,37	25130
321		368 IF (UG0UP-100.0) 369,370,370	25140
322		369 UINCR = 0.5*EPS1	25150
323		GO TO 373	25160
324		370 IF (UG0UP-1000.0) 371,372,372	25170
325		371 UINCR = 0.01*UG0UP	25180
326		GO TO 373	25190
327		372 UINCR = 10.0	25200
328		373 UG0UP = UG0UP+UINCR	25210
329		UP0UP=UP0UP+UINCR	25220
330		H0U=H0U+0.666667*QUEH/QUED*TDIFF/UDIFF*CP6/PRG*UINCR	25230
331		CALL REPLCE(1)	
332		GO TO 362	25250
	C		25260
	C	REPLACE BLOW UP SOLUTION	25270
	C		25280
333		37 CALL REPLCE(2)	

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334      GO TO 40
335      38 CALL REPLCE(2)
336      382 X=X0
337      UG0=UG0DN
338      UP0=UP0DN
339      H0=H00
340      ETAG=0.0
341      ETAP=UP0-UG0
342      H=H0
343      KFLG2=0
344      DX=DX0
345      DX2 = DX0
346      N=0
347      ISTAT = 382
348      IF (IDBUG.EQ.0) GO TO 383
349      WRITE (6,3245) ISTAT
350      WRITE (6,3060) UG0UP,UG0DN,EPSU,EULST,UG0,UP0,UG00,TAU,TG0,CNST9,H
      1,DX,DX0,XX,XF,ETAG,ETAP,H0
      C
      C. INTEGRATE TO SEE IF IT BLOWS UP OR DOWN
      C
351      383 CALLRKSF4(DERIV,CYRL1,Y,DY,ATABL,RTABL,WORK,X,DX,3,0,1,NTRY,IFERR)
352      IF (IDBUG.EQ.0) GO TO 384
353      WRITE (6,3246) BLOW
354      384 IF (BLOW)39,50,398
      C
      C IF IT BLOWS UP, DECREASE UNTIL IT BLOWS DOWN
      C
355      398 IF (UG0DN-100.0) 399,400,400
356      399 UINCR = 0.5*EPS1
357      GO TO 410
358      400 IF (UG0DN-1000.0) 401,402,402
359      401 UINCR = 0.01*UG0DN
360      GO TO 410
361      402 UINCR = 10.0
362      410 UG0DN=UG0DN-UINCR
363      UP0DN=UP0DN-UINCR
364      H00=H00-0.666667*QUEH/QUE0*TDIFF/UDIFF*CPG/PRG*UINCR
365      CALL REPLCE(2)
366      GO TO 382
367      39 CALL REPLCE(1)
368      40 CALL INIT
369      ISTAT = 40
370      DX2 = DX
371      IF (IDBUG.EQ.0) GO TO 4000
372      WRITE (6,3245) ISTAT
373      WRITE (6,3060) UG0UP,UG0DN,EPSU,EULST,UG0,UP0,UG00,TAU,TG0,CNST9,H
      1,DX,DX0,XX,XF,ETAG,ETAP,H0
      C
      C INTEGRATE TO BLOWUP OR DOWN
      C
374      4000 CALLRKSF4(DERIV,CYRL1,Y,DY,ATABL,RTABL,WORK,X,DX,3,0,1,NTRY,IFERR)
375      IF (IDBUG.EQ.0) GO TO 4001
376      WRITE (6,3246) BLOW
377      4001 IF (BLOW)41,50,42

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378      41 CALL REPLCE(1)
379      GO TO 43
380      42 CALL REPLCE(2)
      C
      C      IF INITIAL VELOCITIES ARE CLOSE GO TO 44, IF NOT, TRY AGAIN
      C
381      43 IF (UG0UP-UG0DN-EPS1)/44,44,40
      C
      C      GETXX FINDS A VALUE OF X SUCH THAT UGUP AND UGDOWN ARE WITHIN EPS2
      C
382      44 CALL GETXX
383      IF (ERROR)/60,49,60
384      49 CALL INIT
385      GO TO 34
      C
      C      GET READY FOR FINAL INTEGRATION
      C
386      50 X=X0
387      ETAG=0.0
388      ETAP=UP0-UG0
389      H=H0
390      52 XX=XF
391      KFLG2=0
392      DX = DX2
393      DX0 = DX
394      N=0
395      KFLG3=1
396      IF (IDBUG,EO,0) GO TO 55
397      WRITE (6,3060) UG0UP,UG0DN,EPS0,EULST,UG0,UP0,UG0DT,TAU,TG0,CNST9,H
      1,DX,DX0,XX,XF,ETAG,ETAP,H0
398      55 CALL RKSF4(DERIV,CTRL2,Y,DY,ATABL,RTABL,WONK,X,DX,3,0,1,NTRY,IERR)
399      60 IF (SIGMA)/99,602,99
400      602 WRITE (8) DUMAX,GMACH,ARTIO,UP0UG,TG0TP,VACI,OPTI,RHOGQ,RHOPQ,P6Q,
      1WG
401      REWIND 8
402      WRITE (9) DUMAX,ARTIO,GMNL,U,T,VACINL,OPTINL,RRTONL,PRTONL,RT0IV,
      1RT0IO
403      REWIND 9
404      LINES=0
405      IF (IDNPRT,EO,0) GO TO 72
406      62 READ (8) X,GMACH,ARTIO,UP0UG,TG0TP,VACI,OPTI,RHOGQ,RHOPQ,P6Q, WG
407      IF (X-DUMAX)/63, 72,63
408      63 LINES=LINES+1
409      IF (LINES)/64,64,68
410      64 LINES=50
411      WRITE (6,66)
412      66 FORMAT(1H1,4XX,'LAG CASE',//
      1 100H X M A/ATH UP/UG TG/TP I(VAC) I(
      2OPT) ROG/ROGS ROP/ROPS P/PSTAG WG
413      68 WRITE (6,70) X,GMACH,ARTIO,UP0UG,TG0TP,VACI,OPTI,RHOGQ, RHOPQ,P6Q,W
      1G
414      70 FORMAT (1H ,F8.5,F8.4,F8.3,2F8.4,2F9.3,3F9.5,F11.5)
415      GO TO 62
416      72 LINES=0
417      74 READ (9) X,ARTIO,GMNL,U,T,VACINL,OPTINL,RRTONL,PRTONL,RT0IV,RT0IO

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418      IF(X,GT,XT,AND,NPASS,EQ,0) GO TO 1000
419      7444 IF (X-DUMAX)76, 99,76
420      76 RTOIOF = RTOIO
421      RTOIVF = RTOIV
422      IF (IDNPRT,EQ,0) GO TO 74
423      LINES=LINES-1
424      IF (LINES)78,78,82
425      78 LINES=50
426      WRITE (6,80)
427      80 FORMAT (1H1,43X,11HNO LAG CASE//4X,1HX,8X,1HM,5X,4HA/AT,6X,1HU,8X,
11HT,6X,6HI(VAC),3X,6HI(OPT),2X,8HRO/ROSTG,2X,6HP/PSTG,
21X,19HI/IREF(V) I/IREF(O))
428      82 WRITE (6,84)X,GMNL,ARTIO,U,I,VACINL,OPTINL,RRTONL, PRTONL,RTOIV,RT
10IO
429      84 FORMAT (1H ,F8.5,F8.4,F8.3,F9.1,F9.2,2F9.3,2F9.5,2F10.5)
430      GO TO 74
431      99 FOFRP = SIGX-SIGMA
432      IF (SIGMA)992,999,992
433      992 IF (IDNPRT,EQ,0) GO TO 999
434      WRITE (6,994) RP,FOFRP
435      994 FORMAT(4H0RP= 1PE12.6,5X,12HDFCT(SIGMA)=0PF9.4)
436      999 RETURN
437      1000 RTOIVT=RTOIV
438      NPASS=1
439      GO TO 7444
440      END

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26510

SYMBOL	-----	REFERENCES	-----
12	- 61 62*		
13	- 61 66*		
14	- 68 69*		
15	- 68 72*		
16	- 71 74*		
18	- 65 76*	232	
19	- 77*	136 138 143	
20	- 113 131*		
22	- 132 133*		
23	- 132 134*		
24	- 113 139*		
26	- 140 141*		
27	- 140 142*		
28	- 143* 146		
29	- 143 144*		
30	- 132 140	147*	185 187
31	- 183 184*		
32	- 183 186*		
33	- 226 229	233*	
34	- 263* 385		
35	- 291*		
36	- 300 301*		
37	- 320 333*		
38	- 300 335*		
39	- 354 367*		
40	- 334 368*	381	
41	- 377 378*		
42	- 377 380*		
43	- 379 381*		
44	- 381 382*		
49	- 383 384*		
50	- 300 320	354 377 386*	
52	- 170 390*		
55	- 396 398*		
60	- 238 271	383 399*	
62	- 406* 415		
63	- 407 408*		
64	- 409 410*		
66	- 411WR 412*		
68	- 409 413*		
70	- 413WR 414*		
72	- 405 407	416*	
74	- 417* 422	430	
76	- 419 420*		
78	- 424 425*		
80	- 426WR 427*		
82	- 424 428*		
84	- 428WR 429*		
99	- 399 419	431*	
109	- 16*		
191	- 89 90*		
192	- 89 94*		
193	- 95 96*	130 170 211 258	

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992 - 432 433*
 994 - 434WR 435*
 999 - 432 433 436*
 1000 - 418 437*
 1903 - 82 83*
 1906 - 82 85*
 1932 - 96WR 97*
 1941 - 105 109*
 1942 - 110 113*
 1953 - 118 119*
 1956 - 118 120*
 3005 - 148*
 3015 - 149 150*
 3025 - 157 158*
 3060 - 107WR 178WR 179* 219WR 267WR 296WR 316WR 350WR 373WR 397WR
 3240 - 198 199*
 3241 - 198 201*
 3242 - 205 206*
 3243 - 205 210*
 3244 - 211 212*
 3245 - 106WR 108* 177WR 218WR 266WR 295WR 315WR 349WR 372WR
 3246 - 111WR 112* 182WR 222WR 270WR 299WR 319WR 353WR 376WR
 3247 - 217 220*
 3248 - 221 223*
 3725 - 245 246*
 3621 - 314 317*
 3622 - 318 320*
 4000 - 371 374*
 4001 - 375 377*
 7444 - 419* 439

ALPHA - 8CO
 ARF - 4CO

THE VARIABLE- ARTIO - IS USED BEFORE IT IS DEFINED

ARTIO - 400WR 402WR 406RD 413WR 417RD 428WR
 ATABL - 9CO 109AG 180AG 220AG 268AG 297AG 317AG 351AG 374AG 398AG
 BLK006 - 3*
 BLOW - 8CO 111WR 113 182WR 183 222WR 22J 270WR 272 299WR 300 319WR 320
 CAYR - 353WR 354 376WR 377
 CAY1 - 10CO 13NM 39= 42 43 47 66
 CAY2 - 10CO 13NM 37= 38 39 40 41 47 67 72
 CAY4 - 10CO 13NM 38= 39 40 42 46
 CHANGE - 7CO
 CHEN - 4CO
 CINIT - 13NM 66= 67 72
 CNST1 - 8CO 86 91 121 126 161 166 202 207 249 254
 CNST10 - 8CO 13NM 55= 88 93 123 128 163 168 204 209 251 256
 CNST2 - 8CO 13NM 27= 28
 CNST3 - 8CO 13NM 28= 29
 CNST4 - 8CO 13NM 29= 30 38 46 51
 CNST5 - 8CO 13NM 30= 32
 CNST6 - 8CO 13NM 31= 32
 CNST7 - 8CO 13NM 32= 43
 CNST8 - 8CO 13NM 43= 93
 CNST9 - 8CO 88= 93= 107WR 123= 128= 163= 168= 178WR 204= 209= 219WR 251=

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D256-10020-4

I N D E X

FUNCTION FOF RP(RPART)

PAGE 2A3

EPS1	-	8CO	59	63	14R	322	356	381									
EPS2	-	8CO															
ERROR	-	8CO	1R=	238	383												
ETAG	-	8CO	12EQ	79=	107WR	115=	154=	178WR	195=	219WR	242=	267WR	296WR	306=			
ETAP	-	316WR	340=	350WR	373WR	387=	397WR										
	-	8CO	12EQ	80=	81	83=	107WR	115=	117	119=	145=	156	15R=	178WR			
	-	196=	197	199=	219WR	243=	244	245=	267WR	296WR	307=	316WR	341=	350WR			
	-	373WR	38R=	397WR													
EULST	-	8CO	102=	107WR	149	150	178WR	219WR	233	267WR	296WR	316WR	350WR	373WR			
	-	397WR															
EXEN	-	4CO															
EXIT	-	9R=															
FCTR	-	8CO															
FLAG	-	1R=	190	224	227												
FOF RP	-	1*	431=	434WR													
FR10	-	7CO															
FX1	-	8CO															
FX2	-	8CO															
FX3	-	8CO															
G	-	8CO	31														
GAMRAR	-	10CO	13NM	54=	55												
GAMMA	-	8CO	29	30	54												
GETXX	-	237*	382*														
GMACH	-	8CO	400WR	406RD	413WR												
	-	THE VARIABLE- GMNL - IS USED BEFORE IT IS DEFINED															
GMNL	-	402WR	417RD	428WR													
GMSSP	-	8CO	27														
GMUG	-	8CO															
GMUS	-	8CO															
GNLST	-	8CO															
GNUM	-	8CO															
H	-	8CO	12EQ	94=	107WR	129=	169=	178WR	210=	219WR	257=	267WR	296WR	308=			
	-	316WR	342=	350WR	373WR	389=	397WR										
HON	-	9CO															
HONX	-	8CO	281	287													
HLN	-	8CO	48														
HM	-	8CO	94	129	169	210	257										
HSM	-	8CO	48														
HSTAG	-	8CO															
HTBL	-	9CO															
HUP	-	9CO															
HUPX	-	8CO	280	288													
H0	-	8CO	107WR	178WR	219WR	267WR	296WR	305=	308	316WR	339=	342	350WR	373WR			
	-	389	397WR														
H0D	-	8CO	281=	288=	339	364=											
H0U	-	8CO	280=	287=	305	330=											
IDBUG	-	4CO	105	110	176	181	217	221	265	269	294	298	314	318			
	-	348	352	371	375	396											
IDNPRT	-	4CO	75	405	422	433											
IERR	-	11CO	109AG	180AG	220AG	268AG	297AG	317AG	351AG	374AG	398AG						
INIT	-	291*	36R*	384*													
ISTAT	-	104=	106WR	175=	177WR	216=	218WR	264=	266WR	292=	295WR	313=	315WR	347=			
	-	349WR	369=	372WR													
K	-	11CO															
KFLGI	-	11CO	76=	132	133=	140	141=										

I N D E X

FUNCTION FOFRP(RPART)

PAGE 284

KFLG2	-	11CO	99=	171=	212=	259=	309=	343=	391=										
KFLG3	-	11CO	26=	263=	274=	395=													
KFLG4	-	11CO	271																
KPRNT	-	7CO																	
LFLAG	-	11CO																	
LINF5	-	11CO	19=	404=	408=	409	410=	416=	423=	424	425=								
N	-	11CO	103=	174=	215=	262=	312=	346=	394=										
NDE6	-	11CO																	
NDN	-	11CO																	
NLSW	-	25=																	
NOZTYP	-	4CO																	
NPASS	-	14=	418	438=															
NPTS	-	11CO																	
NTRY	-	11CO	109AG	180AG	220AG	268AG	297AG	317AG	351AG	374AG	398AG								
NUP	-	11CO																	
OPTI	-	THE VARIABLE- OPTI -IS USED BEFORE IT IS DEFINED																	
	-	400WR	406RD	413WR															
OPTINL	-	THE VARIABLE- OPTINL -IS USED BEFORE IT IS DEFINED																	
	-	402WR	417RD	428WR															
OUTPUT	-	13NM	75WR																
P	-	8CO																	
PARWT	-	4CO																	
	-	THE VARIABLE- PGQ -IS USED BEFORE IT IS DEFINED																	
PGQ	-	400WR	406RD	413WR															
PRG	-	8CO	28	330	364														
PROP	-	4CO																	
	-	THE VARIABLE- PRTONL -IS USED BEFORE IT IS DEFINED																	
PRTONL	-	402WR	417RD	428WR															
PSTAG	-	8CO	88	93	123	128	163	168	204	209	251	256							
QUAN1	-	10CO	13NM	33=	37	45	46	50											
QUAN2	-	10CO	13NM	34=	37	44	54												
QUAN3	-	10CO	13NM	35=	49	50													
QUAN4	-	10CO	13NM	36=	38														
QUAN5	-	10CO	13NM	48=	49	53													
QUEH	-	8CO	330	364															
QUEH	-	8CO	330	364															
R	-	8CO																	
RARC1	-	4CO																	
RARC2	-	4CO																	
RC	-	8CO	66																
RCH	-	4CO																	
REP	-	8CO																	
* REPLCE	-	131*	139*	184*	186*	225*	228*	301*	331*	333*	335*	365*	367*	378*					
	-	380*																	
* RETURN	-	436*																	
RGAS	-	8CO	30	32															
RHO	-	8CO																	
	-	THE VARIABLE- RHOGQ -IS USED BEFORE IT IS DEFINED																	
RHOGQ	-	400WR	406RD	413WR															
	-	THE VARIABLE- RHOPQ -IS USED BEFORE IT IS DEFINED																	
RHOPQ	-	400WR	406RD	413WR															
RHOST	-	8CO																	
RHOONL	-	8CO																	
* RKSF4	-	109*	180*	220*	268*	297*	317*	351*	374*	398*									
RP	-	8CO	15=	27	61	236	434WR												

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RPART - 1AG 15
 RPLST - 10CO 61 236=
 THE VARIABLE= RPTONL -IS USED BEFORE IT IS DEFINED
 RPTONL - 402WR 417RD 428WR
 RTAHL - 9CO 109AG 180AG 220AG 268AG 297AG 317AG 351AG 374AG 398AG
 RTH - 8CO 43 66
 THE VARIABLE= RTIO -IS USED BEFORE IT IS DEFINED
 RTIO - 402WR 417RD 420 428WR
 RTIOF - 3CO 420=
 THE VARIABLE= RTIOV -IS USED BEFORE IT IS DEFINED
 RTDIV - 402WR 417RD 421 428WR 437
 RTDIVF - 3CO 421=
 RTDIVT - 3CO 437=
 SIGMA - 8CO 399 431 432
 SIGX - 8CO 431
 SLOP1 - 4CO
 SLOP2 - 4CO
 SORM - 8CO
 THE VARIABLE= T -IS USED BEFORE IT IS DEFINED
 T - 402WR 417RD 428WR
 TAU - 8CO 86= 87 91= 92 107WR 121= 122 126= 127 161= 162 166=
 167 178WR 202= 203 207= 208 219WR 249= 250 254= 255 267WR 296WR
 316WR 350WR 373WR 397WR
 TAUG - 8CO
 FDIFF - 290= 330 364
 TEXTK - 4CO
 TG - 8CO 290
 THE VARIABLE= TGOPT -IS USED BEFORE IT IS DEFINED
 TGOPT - 400WR 406RD 413WR
 TGU - 8CO 87= 88 89 92= 93 94 95 107WR 122= 123 124 127=
 128 129 130 162= 163 164 167= 168 169 170 178WR 203= 204
 205 208= 209 210 211 219WR 250= 251 252 255= 256 257 258
 267WR 296WR 316WR 350WR 373WR 397WR
 THX - 7CO
 TM - 8CO 44 46 47 49 89 94 95 124 129 130 164 169
 170 205 210 211 252 257 258
 TP - 8CO 290
 TSTAG - 8CO 40 41 43 44 47 66 67 72 87 88 92 93
 95 122 123 127 128 130 162 163 167 168 170 203 204
 208 209 211 250 251 255 256 258
 TSTAGK - 4CO
 TT - 8CO 13NM 41=
 THE VARIABLE= U -IS USED BEFORE IT IS DEFINED
 U - 402WR 417RD 428WR
 UDIFF - 289= 330 364
 UG - 8CO 289
 UGDN - 9CO
 UGDNX - 8CO 277 283
 UGTBL - 9CO
 UGUP - 9CO
 UGUPX - 8CO 276 284
 UGO - 8CO 13NM 62= 69= 72= 73 78 81 83 86 91 107WR 117
 119 121 126 134 135= 137= 142= 143 145= 152= 153 156 158
 161 166 178WR 191= 193= 194 197 199 202 207 219WR 234 240=
 241 244 246 249 254 267WR 296WR 303= 307 316WR 337= 341 350WR

UGODN	-	373WR	388	397WR	148	152	178WR	193	219WR	240	267WR	277=	282	284=	296WR
		8CO	107WR	148	152	178WR	193	219WR	240	267WR	277=	282	284=	296WR	
UGOUP	-	316WR	337	350WR	355	358	359	362=	373WR	381	397WR	276=	282	283=	296WR
		8CO	107WR	148	152	178WR	191	219WR	240	267WR	276=	282	283=	296WR	
UGO0	-	303	316WR	321	324	325	328=	350WR	373WR	381	397WR	316WR	350WR	373WR	
		8CO	78=	107WR	153=	178WR	194=	219WR	241=	267WR	296WR	316WR	350WR	373WR	
UINCR	-	397WR	13NM	59=	322=	325=	327=	328	329	330	356=	359=	361=	362	363
		364													
UP	-	8CO	289												
UPDN	-	9CO													
UPDNX	-	8CO	279	285											
		THE VARIABLE- UPOUG -IS USED BEFORE IT IS DEFINED													
UPOUG	-	400WR	406RD	413WR											
UPTBL	-	9CO													
UPUP	-	9CO													
UPUPX	-	8CO	278	286											
UPU	-	8CO	81=	82	84=	86	91	107WR	117=	118	121	126	150	156=	
		157	159=	161	166	178WR	197=	198	200=	202	207	219WR	244=	245	
		247=	249	254	267WR	296WR	304=	307	316WR	338=	341	350WR	373WR	388	
		397WR													
UPODN	-	8CO	279=	286=	338	363=									
UPOUP	-	8CO	278=	285=	304	329=									
UT	-	8CO	13NM	40=	41	42	66								
UTPR	-	10CO	13NM	57=											
		THE VARIABLE- UZERO -IS USED BEFORE IT IS DEFINED													
UZERO	-	62	234=												
U0	-	8CO													
		THE VARIABLE- VACI -IS USED BEFORE IT IS DEFINED													
VACI	-	400WR	406RD	413WR											
		THE VARIABLE- VACINL -IS USED BEFORE IT IS DEFINED													
VACINL	-	402WR	417RD	428WR											
		THE VARIABLE- WG -IS USED BEFORE IT IS DEFINED													
WG	-	400WR	406RD	413WR											
WORK	-	9CO	109AG	180AG	220AG	268AG	297AG	317AG	351AG	374AG	398AG				
WPWG	-	8CO	31	33	34	35	38	44	45	49	51	54	86	91	
		121	126	161	166	202	207	249	254						
WTMOLG	-	4CO													
X	-	8CO	77=	109AG	114=	151=	180AG	189=	220AG	239=	268AG	297AG	302=	317AG	
		336=	351AG	374AG	386=	398AG	406RD	407	413WR	417PD	418	419	428WR		
XDN	-	9CO													
XF	-	8CO	107WR	178WR	219WR	267WR	296WR	316WR	350WR	373WR	390	397WR			
XMAX	-	8CO													
XT	-	8CO	418												
XTBL	-	9CO													
XUP	-	9CO													
XX	-	8CO	107WR	178WR	219WR	267WR	275	296WR	316WR	350WR	373WR	390=	397WR		
X0	-	8CO	20=	23	77	114	151	189	239	275=	302	316	386		
X00	-	8CO													
X1	-	8CO	21=												
X2	-	8CO	22=												
X3	-	8CO	23=												
Y	-	6DI	12EQ	109AG	180AG	220AG	268AG	297AG	317AG	351AG	374AG	398AG			

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1	FUNCTION FOFX(XY)	2550
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	COMMON/TAB1C/INCX,INCY,ISER,ID,KLO	2590
4	COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4, 1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPC0,CP6,CPL,CP,CP5, 2 DELU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EP51,EP52,EP5M, 3 EP5M2,EP5N,EP5U,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH, 4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,H0NX,HLM,HM,HSM,HSTAG, 5 HUPX,P,PRG,PSTAG,QUFO,QUEH,R,RC,REP,RGAS,RHO,RHO0NL,RHOST,RP, 6 RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0, 7 UG00,UG0DN,UG0UP,UGDNX,UGUPX,UP,UP0,UP0DN,UP0UP,UPDNX,UPUPX,UT, 8 WPWG,X,X0,XD0,X1,X2,X3,XF,XMAX,XT,XX	
5	COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3), 1 UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500), 2 WORK(33),XDN(500),XTBL(500),XUP(500)	
6	COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLA6,LINES,N,NDN, 1 NTRY,NUP,NDEG,NPTS	
7	X=XY	3020
8	ISER=0	3030
9	WUGUP=TAB1D(X,XUP,UGUP,K,NUP,NERR)	3040
10	IF (NERR-1)24,20,24	3050
11	20 WUGDN=TAB1D(X,XDN,UGDN,K,NDN,NERR)	3060
12	IF (NERR-1)24,22,24	3070
13	22 FOFX=WUGUP-WUGDN-EP52	3080
14	XY=X	3090
15	RETURN	3100
16	24 WRITE (6,26)NERR,X	3110
17	26 FORMAT (41H1 INTERPOLATION ERROR (IN ROOTS). NERR=I1/ 1 X=,E15,8/' ERROR FROM FOFX IN IDNOZ MODULE')	3120
18	FOFX=0	3140
19	ERROR=1	3150
20	RETURN	3160
21	END	3170

SYMBOL	REFERENCES
20	10 11*
22	12 13*
24	10 12 16*
26	16WR 17*
ALPHA	4C0
ATABL	5C0
BLOW	4C0
CNST1	4C0
CNST10	4C0
CNST2	4C0
CNST3	4C0
CNST4	4C0
CNST5	4C0
CNST6	4C0
CNST7	4C0
CNST8	4C0
CNST9	4C0
COM02	4*
COM03	5*
COM05	6*
CPCG	4C0
CPG	4C0
CPL	4C0
CPP	4C0
CPS	4C0
DELU	4C0
DENOM	4C0
DMOND	4C0
DMONU	4C0
DNLST	4C0
DQMAX	4C0
DUMAX	4C0
DX	4C0
DX0	4C0
OY	5C0
EPSM	4C0
EPSM2	4C0
EPSN	4C0
EPSU	4C0
EPS1	4C0
EPS2	4C0 13
ERROR	4C0 19=
ETAG	4C0
ETAP	4C0
EULST	4C0
FCTR	4C0
FOFX	1* 13= 18=
FX1	4C0
FX2	4C0
FX3	4C0
G	4C0
GAMMA	4C0
GMACH	4C0

GMSSP	-	400			
GMUG	-	400			
GMUS	-	400			
GNLST	-	400			
GNUM	-	400			
H	-	400			
HON	-	500			
HONX	-	400			
HLM	-	400			
HM	-	400			
HSM	-	400			
HSTAG	-	400			
HTBL	-	500			
HUP	-	500			
HUPX	-	400			
HO	-	400			
HOD	-	400			
HOU	-	400			
IN	-	300			
IEHR	-	600			
INCX	-	300			
INCY	-	300			
ISEP	-	300	8=		
K	-	600	9	11	
KFLG1	-	600			
KFLG2	-	600			
KFLG3	-	600			
KFLG4	-	600			
KLO	-	300			
LFLAG	-	600			
LINES	-	600			
N	-	600			
NDEG	-	600			
NDN	-	600	11		
NEWR	-	9	10	11	12 16WR
NPTS	-	600			
NTRY	-	600			
NUP	-	600	9		
P	-	400			
PHG	-	400			
PSTAG	-	400			
QUED	-	400			
QUEH	-	400			
R	-	400			
RC	-	400			
REP	-	400			
RETURN	-	15*	20*		
RGAS	-	400			
RHO	-	400			
RHOST	-	400			
RHOGNL	-	400			
RP	-	400			
RTAPL	-	500			
RTH	-	400			

THE VARIABLE- NFRF -IS USED BEFORE IT IS DEFINED

THE VARIABLE- TAB10		-IS USED BEFORE IT IS DEFINED	
SIGMA	4C0		
SIGX	4C0		
SQRM	4C0		
TAB1C	3*		
TAB1D	9	11	
TAU	4C0		
TAUG	4C0		
TG	4C0		
TG0	4C0		
TM	4C0		
TP	4C0		
TSTAG	4C0		
TT	4C0		
UG	4C0		
UGDN	5C0	11	
UGDNX	4C0		
UGTHL	5C0		
UGUP	5C0	9	
UGUPX	4C0		
UG0	4C0		
UGQDN	4C0		
UGQUP	4C0		
UG00	4C0		
UP	4C0		
UPDN	5C0		
UPDNX	4C0		
UPTBL	5C0		
UPUP	5C0		
UPUPX	4C0		
UP0	4C0		
UPQDN	4C0		
UPQUP	4C0		
UT	4C0		
U0	4C0		
WORK	5C0		
WPWG	4C0		
WUGDN	11=	13	
WUGUP	9=	13	
X	4C0	7=	9 11 14 16WR
XDN	5C0	11	
XF	4C0		
XMAX	4C0		
XT	4C0		
XTBL	5C0		
XUP	5C0	9	
XX	4C0		
XY	1AG	7	14=
X0	4C0		
X00	4C0		
X1	4C0		
X2	4C0		
X3	4C0		

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1      SUBROUTINE GETAS(Z)                                7670
2      IMPLICIT REAL*8 (A-H,O-Z)
3      DIMENSION W(200),ELE(9,10)                        7690
4      COMMON/COM05/ TERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINFS,N,NDN,
5      1 NTRY,NUP,NDEG,NPTS
6      COMMON/COM06/ AOD,A(9),RL(200),XL(200),HDELT,RANDER,RMDRK,AR,
7      1 RTHRT,XSAVE
8      IF (Z-XSAVE)12,40,12                                7760
9      XSAVE=Z                                              7770
10     S0=0.0                                              7780
11     S1=0.0                                              7790
12     S2=0.0                                              7800
13     S3=0.0                                              7810
14     S4=0.0                                              7820
15     S5=0.0                                              7830
16     S6=0.0                                              7840
17     S7=0.0                                              7850
18     DO 20 I=1,NPTS                                     7860
19     DX=DABS(Z-XL(I))
20     IF (DX-RMDRK)14,14,20                                7880
21     W(I)=1.0/(1.0+AOD*DX**2)                             7890
22     DO 15 KT=1,4                                         7900
23     W(I)=W(I)**2                                          7910
24     XW=XL(I)*W(I)                                         7920
25     XXW=XW*XL(I)                                         7930
26     XXXW=XXW*XL(I)                                       7940
27     S0=S0+W(I)                                           7950
28     S1=S1+XW                                              7960
29     S2=S2+XXW                                             7970
30     S3=S3+XXXW                                            7980
31     S4=S4+XXW*XL(I)                                       7990
32     S5=S5+W(I)*RL(I)                                     8000
33     S6=S6+XW*RL(I)                                       8010
34     S7=S7+XXW*RL(I)                                       8020
35     CONTINUE                                             8030
36     S1=S1/HDELT                                           8040
37     HSQ=HDELT*HDELT                                       8050
38     S2=S2/HSQ                                             8060
39     S3=S3/HSQ/HDELT                                       8070
40     S4=S4/HSQ/HDELT                                       8080
41     ELE(1,1)=S0                                           8090
42     ELE(1,2)=S1                                           8100
43     ELE(2,1)=S1                                           8110
44     ELE(1,3)=S2                                           8120
45     ELE(2,2)=S2                                           8130
46     ELE(3,1)=S2                                           8140
47     ELE(2,3)=S3                                           8150
48     ELE(3,2)=S3                                           8160
49     ELE(3,3)=S4                                           8170
50     ELE(1,4)=S5                                           8180
51     ELE(2,4)=S6/HDELT                                       8190
52     ELE(3,4)=S7/HSQ                                       8200
53     CALL MATS(FLE,A,3 ,1,MERR)                          8210
54     IF (MERR)30,34,30                                     8220
55     WRITE (6,32)Z...                                     8230

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54	32	FORMAT (54H0MATRIX SINGULAR IN COMPUTATION OF NOZZLE RADIUS AT X=,	8240
		1F8.5/ ' ERROR IN GETAS FROM TON0Z MODULE')	
55	34	DIV=1.0	8270
56		DO 36 J=1,3	8280
57		A(J)=A(J)/DIV	8290
58	36	DIV=DIV*HDELT	8300
59	40	RETURN	8310
60		END	8320

SYMBOL	-----	REFERENCES	-----
12	=	6	7*
14	=	18	19*
15	=	2000	21*
20	=	1600	1A
30	=	52	53*
32	=	53WR	54*
34	=	52	55*
36	=	5600	58*
40	=	6	59*
A	=	500	51AG
ADD	=	500	19
AR	=	500	
* COM05	=	4*	
* COM06	=	5*	
* DABS	=	17	
DIV	=	55=	57
DX	=	17=	18
ELE	=	30I	39=
		51AG	40=
			41=
			42=
			43=
			44=
			45=
			46=
			47=
			48=
			49=
			50=
* GETAS	=	1*	
HDELT	=	500	34
HSQ	=	35=	35
I	=	1600	17
IERR	=	400	19
J	=	5600	21
K	=	400	22
KFLG1	=	400	23
KFLG2	=	400	24
KFLG3	=	400	25
KFLG4	=	400	29
KT	=	2000	30
LFLAG	=	400	31
LINES	=	400	32
* MATS	=	51*	
MERR	=	51AG	57
N	=	400	
NDEG	=	400	
NDN	=	400	
NPTS	=	400	1600
NTRY	=	400	
NUP	=	400	
RAMDER	=	500	
* RETURN	=	59*	
RL	=	500	30
RMDRK	=	500	31
RTHRT	=	500	32
S0	=	8=	25=
S1	=	9=	26=
S2	=	10=	27=
S3	=	11=	28=
S4	=	12=	29=
S5	=	13=	30=
S6	=	14=	31=

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

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1      SUBROUTINE GETXX                                1590
2      IMPLICIT REAL*8 (A-H,O-Z)
3      EXTERNAL FOFX                                1640
4      DIMENSION SOLN(3)                            1630
5      COMMON/TAB1C/INCX,INCY,ISER,ID,KLO            1650
6      COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
1      CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPC6,CP6,CPL,CP,CP5,
2      QFLU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EPS1,EPS2,EPSM,
3      EPSM2,EPSM,FPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
4      GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,HDNX,HLM,HM,HSM,HSTAG,
5      HUPX,P,PRG,PSTAG,QUEQ,QUEH,R,RC,REP,RGAS,RHO,RH00NL,RH0ST,RP,
6      RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,UO,UG,UG0,
7      UG00,UG0DN,UG0UP,UG0NX,UG0PX,UP,UP0,UP0DN,UP0UP,UP0NX,UP0PX,UT,
8      WPMG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
7      COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
1      UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
2      WORK(33),XDN(500),XTBL(500),XUP(500)
8      COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN,
1      NTRY,NUP,NDEG,NPTS
9      IF (XUP(NUP)-XDN(NDN))20,20,22                                2090
10     20 XMAX=XUP(NUP)                                              2100
11     GO TO 24                                                    2110
12     22 XMAX=XDN(NDN)                                              2120
13     24 IF (UGUP(1)-UGDN(1)-EPS2)30,26,26                        2130
14     26 WRITE (6,28)UGUP(1),UGDN(1),EPS2                        2140
15     28 FORMAT (10H1 UGUP(1)=F10.4,13H, UGDN(1)=F10.4,35H, THEIR DIF 2150
16     FERENCE EXCEEDS EPS2=F7.4/' ERROR FROM GETXX IN IDNOZ MODULE')
17     ERROR=1                                                    2170
18     RETURN                                                    2180
19     30 DMOND=0.0                                                  2190
20     ISER=0                                                       2200
21     WUGUP=TAB1D(XMAX,XUP,UGUP,K,NUP,NERR)                      2210
22     IF (NERR-1)46,32,46                                          2220
23     32 DMOND=0.0                                                  2230
24     WUGDN=TAB1D(XMAX,XDN,UGDN,K,NDN,NERR)                      2240
25     IF (NERR-1)46,34,46                                          2250
26     34 IF (WUGUP-WUGDN-EPS2)40,40,35                            2260
27     35 XTOL=.01*(XMAX-X0)                                        2270
28     CALL ROOTS4(X0,XMAX,FOFX,XTOL,0.,0.,2,ISOLN,SOLN)          2280
29     IF (ISOLN-1)36,42,36                                          2290
30     36 WRITE (6,38)ISOLN                                          2300
31     38 FORMAT(24H1 ERROR IN ROOTS. ISOLN=11/' ERROR FROM GETXX IN IDNOZ M
32     $ODULE')
33     ERROR=1                                                    2320
34     RETURN                                                    2330
35     40 SOLN(1)=XMAX                                              2340
36     42 XX=SOLN(1)                                              2350
37     DMOND=0.0                                                  2360
38     UG0NX=TAB1D(XX,XDN,UGDN,K,NDN,NERR)                      2370
39     ISER=1                                                       2380
40     UP0NX=TAB1D( XX,XDN,UPDN,K,NDN,NERR)                      2390
41     HDNX =TAB1D( XX,XDN,HDN,K,NDN,NERR)                      2400
42     IF (NERR-1)46,44,46                                          2410
43     44 DMOND=0.0                                                  2420
44     ISER=0                                                       2430

```

I N D E X

SUBROUTINE GETXX

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43	..	UGUPX=TABLED(XX,XUP,UGUP,K,NUP,NERR)	2440
44		ISER=1	2450
45		UPUPX=TABLED(XX,XUP,UPUP,K,NUP,NERR)	2460
46	..	HUPX =TABLED(XX,XUP,HUP,K,NUP,NERR)	2470
47		IF (NERR=1) 46,50,46	2480
48	46	WRITE (6,48)NERR	2490
49	48	FORMAT(30H) INTERPOLATION ERROR. NERR=11/1 ERROR FROM GETXX IN I	
		\$DNOZ MODULE*)	
50		ERROR=1	2510
51	50	RETURN	2520
52		END	2530

SYMBOL	-----	REFERENCES	-----
20	- 9	10*	
22	- 9	12*	
24	- 11	13*	
26	- 13	14*	
28	- 14WR	15*	
30	- 13	18*	
32	- 21	22*	
34	- 24	25*	
35	- 25	26*	
36	- 28	29*	
38	- 29WR	30*	
40	- 25	33*	
42	- 28	34*	
44	- 40	41*	
46	- 21	24	40 47 48*
48	- 48WR	49*	
50	- 47	51*	
ALPHA	- 6C0		
ATARL	- 7C0		
BLOW	- 6C0		
CNST1	- 6C0		
CNST10	- 6C0		
CNST12	- 6C0		
CNST13	- 6C0		
CNST14	- 6C0		
CNST15	- 6C0		
CNST16	- 6C0		
CNST17	- 6C0		
CNST18	- 6C0		
CNST19	- 6C0		
COM02	- 6*		
COM03	- 7*		
COM05	- 8*		
CPCG	- 6C0		
CPG	- 6C0		
CPL	- 6C0		
CPP	- 6C0		
CPS	- 6C0		
DELU	- 6C0		
DENUM	- 6C0		
DMOND	- 6C0	22= 35=	
DMONU	- 6C0	18= 41=	
DNLS1	- 6C0		
DQMAX	- 6C0		
DUMAX	- 6C0		
DX	- 6C0		
DX0	- 6C0		
OY	- 7C0		
EPSM	- 6C0		
EPSM2	- 6C0		
EPSN	- 6C0		
EPSU	- 6C0		
EPS1	- 6C0		

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	PRG	-	6C0							
	PSTAG	-	6C0							
	QUEN	-	6C0							
	QUEH	-	6C0							
	R	-	6C0							
	RC	-	6C0							
	REP	-	6C0							
*	RETURN	-	17*	32*	51*					
	RGAS	-	6C0							
	RHO	-	6C0							
	RHUST	-	6C0							
	RHOONL	-	6C0							
*	ROOTS4	-	27*							
	RP	-	6C0							
	RTABL	-	7C0							
	RTH	-	6C0							
	SIGMA	-	6C0							
	SIGX	-	6C0							
	SOLN	-	4DI	27AG	33=	34				
	SQRM	-	6C0							
*	TAB1C	-	5*							
	THE VARIABLE- TAB1D - IS USED BEFORE IT IS DEFINED									
	TAB1D	-	20	23	36	38	39	43	45	46
	TAU	-	6C0							
	TAUG	-	6C0							
	TG	-	6C0							
	TG0	-	6C0							
	TH	-	6C0							
	TP	-	6C0							
	TSTAG	-	6C0							
	TT	-	6C0							
	UG	-	6C0							
	UGDN	-	7C0	13	14WR	23	36			
	UGDNX	-	6C0	36=						
	UGTHL	-	7C0							
	UGUP	-	7C0	13	14WR	20	43			
	UGUPX	-	6C0	43=						
	UG0	-	6C0							
	UG0DN	-	6C0							
	UG0UP	-	6C0							
	UG00	-	6C0							
	UP	-	6C0							
	UPDN	-	7C0	38						
	UPDNX	-	6C0	38=						
	UPTHL	-	7C0							
	UPUP	-	7C0	45						
	UPUPX	-	6C0	45=						
	UP0	-	6C0							
	UP0DN	-	6C0							
	UP0UP	-	6C0							
	UT	-	6C0							
	U0	-	6C0							
	WORK	-	7C0							
	WPWG	-	6C0							
	WU6DN	-	23=	25						

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SUBROUTINE GETXX

PAGE 300

WUGUP	-	20=	25						
X	-	6C0							
XDN	-	7C0	9	12	23	36	38	39	
XF	-	6C0							
XMAX	-	6C0	10=	12=	20	23	26	27AG	33
XT	-	6C0							
XTBL	-	7C0							
XTOL	-	26=	27AG						
XUP	-	7C0	9	10	20	43	45	46	
XX	-	6C0	34=	36	38	39	43	45	46
X0	-	6C0	26	27AG					
X00	-	6C0							
X1	-	6C0							
X2	-	6C0							
X3	-	6C0							

```

1  SUBROUTINE INIT
2  IMPLICIT REAL*8 (A-H,O-Z)
3  COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
   1  CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPP,CPS,
   2  DELU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EPS1,FPS2,EPSH,
   3  EPSM2,EPSP,EPSP,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
   4  GMSSP,GMUG,GMUS,GNLST,GNUM,H0,HOD,HOU,HDNX,HLM,HM,HSM,HSTAG,
   5  HUPX,P,PRG,PSTAG,QUEO,QUEH,R,RC,REP,RGAS,RHO,RHODNL,RHOST,RP,
   6  RTH,SIGMA,SIGX,SQRM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
   7  UG00,UG0DN,UG0UP,UG0NX,UG0PX,UP,UP0,UP0DN,UP0UP,UP0NX,UP0PX,UT,
   8  WPWG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
4  COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
   1  UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
   2  WORK(33),XDN(500),XTBL(500),XUP(500)
5  COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN,
   1  NTRY,NUP,NDFG,NPTS
6  X=X0
7  UG0=0.5*(UG0UP+UG0DN)
8  UP0=0.5*(UP0UP+UP0DN)
9  H0=0.5*(H0U+H0D)
10 ETAG=0.0
11 ETAP=UP0-UG0
12 H=H0
13 KFLG2=0
14 DX=DX0
15 N=0
16 RETURN
17 END

```

4350

4810

4820

4830

4840

4850

4860

4870

4880

4890

4900

4910

4920

SYMBOL	-----	REFERENCES	-----
ALPHA	- 3C0		
ATAHL	- 4C0		
BLOW	- 3C0		
CNST1	- 3C0		
CNST10	- 3C0		
CNST2	- 3C0		
CNST3	- 3C0		
CNST4	- 3C0		
CNST5	- 3C0		
CNST6	- 3C0		
CNST7	- 3C0		
CNST8	- 3C0		
CNST9	- 3C0		
* COM02	- 3*		
* COM03	- 4*		
* COM05	- 5*		
CPCG	- 3C0		
CPG	- 3C0		
CPL	- 3C0		
CPP	- 3C0		
CPS	- 3C0		
DELU	- 3C0		
DENOM	- 3C0		
DMOND	- 3C0		
DMONU	- 3C0		
DNLST	- 3C0		
DQMAX	- 3C0		
DUMAX	- 3C0		
DX	- 3C0	14=	
DX0	- 3C0	14	
DY	- 4C0		
EPSM	- 3C0		
EPSM2	- 3C0		
EPSN	- 3C0		
EPSU	- 3C0		
EPS1	- 3C0		
EPS2	- 3C0		
ERROR	- 3C0		
ETAG	- 3C0	10=	
ETAP	- 3C0	11=	
EULST	- 3C0		
FCTH	- 3C0		
FX1	- 3C0		
FX2	- 3C0		
FX3	- 3C0		
G	- 3C0		
GAMMA	- 3C0		
GMACH	- 3C0		
GMSSP	- 3C0		
GMUG	- 3C0		
GMUS	- 3C0		
GNLST	- 3C0		
GNUM	- 3C0		

H	-	300	12=
HON	-	400	
HONX	-	300	
HLN	-	300	
HM	-	300	
HSM	-	300	
HSTAG	-	300	
HTBL	-	400	
HUP	-	400	
HUPX	-	300	
HO	-	300	"9= 12
HOD	-	300	9
HOU	-	300	9
IERR	-	500	
INIT	-	1*	
K	-	500	
KFLG1	-	500	
KFLG2	-	500	13=
KFLG3	-	500	
KFLG4	-	500	
LFLAG	-	500	
LINES	-	500	
N	-	500	15=
NDEG	-	500	
NDN	-	500	
NPTS	-	500	
NTRY	-	500	
NUP	-	500	
P	-	300	
PRG	-	300	
PSTAG	-	300	
QUEN	-	300	
QUEH	-	300	
R	-	300	
RC	-	300	
REP	-	300	
RETURN	-	16*	
RGAS	-	300	
RHO	-	300	
RHOST	-	300	
RHOONL	-	300	
RP	-	300	
RTAHL	-	400	
RTH	-	300	
SIGMA	-	300	
SIGX	-	300	
SORM	-	300	
TAU	-	300	
TAUG	-	300	
TG	-	300	
TGD	-	300	
TM	-	300	
TP	-	300	
TSTAG	-	300	
TT	-	300	

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SUBROUTINE INIT

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UG - 3C0
 UGDN - 4C0
 UGDNX - 3C0
 UGTBL - 4C0
 UGUP - 4C0
 UGUPX - 3C0
 UG0 - 3C0
 UG0DN - 3C0
 UG0UP - 3C0
 UG00 - 3C0
 UP - 3C0
 UPDN - 4C0
 UPDNX - 3C0
 UPTBL - 4C0
 UPUP - 4C0
 UPUPX - 3C0
 UP0 - 3C0
 UP0DN - 3C0
 UP0UP - 3C0
 UT - 3C0
 U0 - 3C0
 WORK - 4C0
 WPWG - 3C0
 X - 3C0
 XDN - 4C0
 XF - 3C0
 XMAX - 3C0
 XT - 3C0
 XTBL - 4C0
 XUP - 4C0
 XX - 3C0
 X0 - 3C0
 X00 - 3C0
 X1 - 3C0
 X2 - 3C0
 X3 - 3C0

7= 11
 7
 7

8= 11
 8
 8

6=

6

```

SUBROUTINE LKUP (XX,RR,RPR,RDBLP,KK)
1      SUBROUTINE LKUP (XX,RR,RPR,RDBLP,KK)
2      IMPLICIT REAL*8 (A-H,O-Z)
3      COMMON/COMMON1/ISTAG,K,TEXIT,K,CHEN,EXFN,PROP,WTMOLG,CUG,1,
4      1 PARWT,KC4,SLOP1,SLOP2,PARC1,PARC2,APF,NOZTYP,1DRUG,1DNPT
5      DIMENSION RP(200),RPRIM(200)
6      EXTERNAL RADIUS,ORDX,AREAR
7      DIMENSION SOLN(2)
8      COMMON/COMMON5/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NON,
9      1 NTRY,NUP,NDEG,NPTS
10     COMMON/COMMON6/ AOD,A(9),RL(200),XL(200),HDELT,RAMDER,RMORK,AR,
11     1 RTHRT,XSAVE
12     IF (KK-2)20,50,90
13     20 NDEG=2
14     IF (NPTS-NDEG-1)36,38,38
15     36 WRITE (6,37)NPTS,NDEG
16     37 FORMAT (19HNUMBER OF POINTS (,I6,43H) IS LESS THAN THE ORDER OF A
17     1 APPROXIMATION (,I6,27H) PLUS ONE. CANNOT PROCEED. /) ERROR FROM LK
18     2UP IN IDNO7 MODULE)
19     CALL EXIT
20     38 ENPTS=NPTS
21     HDELT=XL(NPTS)/(ENPTS-1.0)
22     EN=NDEG
23     RAMDER=(EN+2.0)*HDELT
24     AOD=0.1058/RAMDER**2
25     RMORK=2.259*RAMDER
26     XSAVE=1.E+38
27     DO 384 I=1,NPTS
28     RPRIM(I)=ORDX(XL(I))
29     XMAX=0.0
30     IF (XMAX-XL(I))383,384,384
31     383 XMAX=XL(I)
32     384 RP(I)=RADIUS(XL(I))
33     IF (IDNPRT.EQ.0) GO TO 392
34     WRITE (6,382)
35     382 FORMAT (36H1COMPUTED (SMOOTHED) NOZZLE GEOMETRY)
36     389 WRITE (6,38) (XL(I),I=1,NPTS)
37     28 FORMAT (9H0X VALUES/(,I,8F12.5))
38     WRITE (6,30) (RP(I),I=1,NPTS)
39     30 FORMAT (10H0RP VALUES/(,I,8F12.5))
40     WRITE (6,3892) (RPRIM(I),I=1,NPTS)
41     3892 FORMAT (10R PRIME VALUES/(,I,8F12.5))
42     392 D=XL(NPTS)
43     46 XTOL=0.0001*D
44     CALL ROOTS4(0.0,XMAX,ORDX,XTOL,0.0,0.2,ISOLN,SOLN)
45     IF (ISOLN-1)47,49,47
46     47 WRITE (6,48)
47     48 FORMAT (19H1CANNOT FIND THROAT/ ERROR FROM LKUP IN IDNOZ MODULE)
48     CALL EXIT
49     49 XTH=SOLN(1)
50     RR=RADIUS(XTH)
51     RPR=RADIUS(XTH)
52     RTHRT=RPR
53     RDBLP=XTH
54     IF (IDNPRT.EQ.0) GO TO 496
55     WRITE (6,495) XTH,RPR

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ORIGINAL PAGE IS
OF POOR QUALITY

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51 495 FORMAT(12H-THROAI AT (,F6.4,1H, F6.4,1H))
52 496 CALL ROOTS4(XTH,XMAX,AREAR,XTOL,0.,0.,2,ISOLN,SOLN) 6670
53 IF (ISOLN-1) 491,493,491 6680
54 491 AREND=AREAR(XMAX) 6690
55 WRITE (6,492)AREND 6700
56 492 FORMAT (59H-CANNOT FIND EXIT. AREA RATIO AT MAXIMUM INPUT X VALUF 6710
    11S F7.3/ ' ERROR FROM LKUP. IN IDNOZ MODULE')
57 CALL EXIT 6730
58 493 XX=SOLN(1) 6740
59 XLST=1,E+38 6750
60 RETURN 6760
61 50 IF (NOZTYP-1) 502,502,51 6770
62 502 RETURN
63 51 IF (XX-XLST) 52,70,52 6800
64 52 CALL GETAS(XX) 6810
65 FLJ=EN 6820
66 RR=A(NDEG+1) 6830
67 RPR=FLJ*A(NDEG+1) 6840
68 J=NDEG 6850
69 55 FLJ=FLJ-1.0 6860
70 RR=RR*XX+A(J) 6870
71 IF (J-1) 60,60,58 6880
72 58 RPR=RPR*XX+FLJ*A(J) 6890
73 J=J-1 6900
74 GO TO 55 6910
75 60 XLST=XX 6920
76 RLST=RR 6930
77 RPLST=RPR 6940
78 RETURN 6950
79 70 RR=RLST 6960
80 RPR=RPLST 6970
81 RETURN 6980
82 90 CONTINUE 6990
83 92 RETURN
84 END 7010

```

SYMBOL	-----	REFERENCES	-----
20	- 9	10*	
24	- 31WR	32*	
30	- 33WR	34*	
36	- 11	12*	
37	- 12WR	13*	
38	- 11	15*	
46	- 38*		
47	- 40	41*	
48	- 41WR	42*	
49	- 40	44*	
50	- 9	61*	
51	- 61	63*	
52	- 63	64*	
55	- 69*	74	
58	- 71	72*	
60	- 71	75*	
70	- 63	79*	
90	- 9	82*	
92	- 83*		
382	- 29WR	30*	
383	- 25	26*	
384	- 22DO	25	27*
389	- 31*		
392	- 28	37*	
491	- 53	54*	
492	- 55WR	56*	
493	- 53	58*	
495	- 50WR	51*	
496	- 49	52*	
502	- 61	62*	
3892	- 35WR	36*	
A	- 8CO	66	67 70 72
AOD	- 8CO	19=	
AR	- 8CO		
* AREAR	- 5EX	52AG	54
ARENO	- 54=	55WR	
ARF	- 3CO		
CHEN	- 3CO		
* COM01	- 3*		
* COM05	- 7*		
* COM06	- 8*		
CUGO	- 3CO		
D	- 37=	38	
* DRDX	- 5EX	23	39AG
EN	- 17=	18	65
ENPTS	- 15=	16	
EXEN	- 3CO		
* EXIT	- 14*	43*	57*
FLJ	- 65=	67	69= 72
* GETAS	- 64*		
HDEL T	- 8CO	16=	18
I	- 22DO	23	25 26 27 31WR 33WR 35WR
IDBUG	- 3CO		

I N D E X

SUBROUTINE LKUP (XX,RR,RPR,RDBLP,KK)

PAGE 30A

IDNPRT	-	3C0	28	49																
IEPR	-	7C0																		
ISOLN	-	39AG	40	52AG	53															
J	-	68=	70	71	72	73=														
K	-	7C0																		
KFLG1	-	7C0																		
KFLG2	-	7C0																		
KFLG3	-	7C0																		
KFLG4	-	7C0																		
KK	-	1AG	9																	
LFLAG	-	7C0																		
LINES	-	7C0																		
* LKUP	-	1*																		
N	-	7C0																		
NDEG	-	7C0	10=	11	12WR	17	66	67	68											
NDN	-	7C0																		
NOZTYP	-	3C0	61																	
NPTS	-	7C0	11	12WR	15	16	22D0	31WR	33WR	35WR	37									
NTRY	-	7C0																		
NUP	-	7C0																		
PARWT	-	3C0																		
PROP	-	3C0																		
* RADIUS	-	5FX	27	45	46															
RAMDER	-	8C0	18=	19	20															
RARC1	-	3C0																		
RARC2	-	3C0																		
RCH	-	3C0																		
RDBLP	-	1AG	48=																	
* RETURN	-	60*	62*	78*	81*	83*														
RL	-	8C0																		
RLST	-	76=	79																	
RMDRK	-	8C0	20=																	
* ROOTS4	-	39*	52*																	
RP	-	4D1	27=	33WR																
RPLST	-	77=	80																	
RPR	-	1AG	46=	47	50WR	67=	72=	77	80=											
RPRIM	-	4D1	23=	35WR																
RR	-	1AG	45=	66=	70=	76	79=													
RTHRT	-	8C0	47=																	
SLOP1	-	3C0																		
SLOP2	-	3C0																		
SOLN	-	6D1	39AG	44	52AG	58														
TEXTK	-	3C0																		
YSTAGK	-	3C0																		
WTMOL0	-	3C0																		
XL	-	8C0	16	23	25	26	27	31WR	37											
XLST	-	59=	63	75=																
XMAX	-	24=	25	26=	39AG	52AG	54													
XSAVE	-	8C0	21=																	
XTH	-	44=	46	48	50WR	52AG														
XTOL	-	38=	39AG	52AG																
XX	-	1AG	58=	63	64AG	70	72	75												

2-309

D255-10020-4

1	SUBROUTINE MACHR(RINTP,RST,G,TMACH,GMACH)	26530
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	GAMM=G-1.0	26540
4	GAMA=GAMM/2.0	26550
5	GAMB=G+1.0	26560
6	GAMBR=GAMB/2.0	26570
7	GAMEX=GAMBR/GAMM	26580
8	XM=GMACH	26590
9	ICTR=0	26600
10	GEX=GAMEX-1.0	26610
11	AP=(HST/RINTP)**2	26620
12	IF (AP.GT.0.97) GO TO 380	26630
13	ABDC=2.0*AP*GAMA*GAMEX/GAMBR	26640
14	BLIP=(1.0*GAMA*XM**2)/GAMBR	26650
15	XNA=XM-((XM-AP*BLIP**GAMEX)/(1.0-ABDC*XM*HL[P**GEX]))	26660
16	TEST=DABS(XNA-XM)	
17	IF (TEST-.001) 130,130,120	26680
18	120 XM=XNA	26690
19	ICTR=ICTR+1	26700
20	IF (ICTR-25) 110,110,380	26710
21	130 IF (XNA.GT.1.0.OR,XNA.LT.0.0) GO TO 380	26720
22	TMACH=XNA	26730
23	RETURN	26740
24	380 TMACH=GMACH	26750
25	RETURN	26760
26	END	26770

2-311

1		SUBROUTINE MATS (A,X,N,M,MATERR)	8770
2		IMPLICIT REAL*8 (A-H,O-Z)	
3		DIMENSION A(9,10),X(9,1)	8780
4		MATERR=0	8790
5		MM=N*M	8800
6		DO 15 I=2,N	8810
7	70	II=I-1	8820
8	7	DO 15 J=1,II	8830
9	8	IF (A(I,J))9,15,9	8840
10	9	IF (DABS(A(J,J))-DABS(A(I,J)))11,10,10	
11	10	R=A(I,J)/A(J,J)	8860
12		GO TO 130	8870
13	11	R=A(J,J)/A(I,J)	8880
14		DO 12 K=1,MM	8890
15		B=A(J,K)	8900
16		A(J,K)=A(I,K)	8910
17	12	A(I,K)=B	8920
18	130	JJ=J+1	8930
19	13	DO 14 K=JJ,MM	8940
20	14	A(I,K)=A(I,K)-R*A(J,K)	8950
21	15	CONTINUE	8960
22		IF (DABS(A(N,N))-1.00-10)16,16,17	
23	16	MATERR=1	8980
24		RETURN	8990
25	17	DO28J=1,M	9000
26		KK=N+J	9010
27		X(N,J)=A(N,KK)/A(N,N)	9020
28		DO28I=2,N	9030
29		JJ=N-I+1	9040
30		R=0.0	9050
31		II=N-I+2	9060
32		DO 25 K=II,N	9070
33	25	B=R*A(JJ,K)*X(K,J)	9080
34		IF (DABS(A(JJ,JJ))-1.00-10)16,16,28	
35	28	X(JJ,J)=(A(JJ,KK)-B)/A(JJ,JJ)	9100
36		RETURN	9110
37		END	9120

SYMBOL	REFERENCES
7	8*
8	9*
9	9 10*
10	10 11*
11	10 13*
12	1400 17*
13	19*
14	1900 20*
15	600 800 9 21*
16	22 23* 34
17	22 25*
25	3200 33*
28	2500 2800 34 35*
70	7*
130	12 18*
A	1AG 30I 9 10 11 13 15 16= 17= 20= 22 27 33
B	34 35
DABS	15= 17 30= 33= 35
I	10 22 34
II	600 7 9 10 11 13 16 17 20 2800 29 31
J	7= 800 31= 3200
JJ	800 9 10 11 13 15 16 18 20 2500 26 27 33
KK	35
M	18= 1900 29= 33 34 35
MATERR	1400 15 16 17 1900 20 3200 33
MATS	26= 27 35
MM	1AG 5 2500
N	1AG 4= 23=
R	1*
RETURN	5= 1400 1900
X	1AG 5 600 22 26 27 2800 29 31 3200
	11= 13= 20
	24* 36*
	1AG 30I 27= 33 35=

```

1  SUBROUTINE OPUT                                12020
2  IMPLICIT REAL*8 (A-H,O-Z)
3  COMMON/PRINT/TERM1,TERM2,DIFFQ,XLST
4  COMMON/COM01/TSTAG,TEXTK,CHEN,EXEN,PROP,WTMOLG,CUGO,
5  1 PARWT,KCH,SLOP1,SLOP2,RARC1,RARC2,ARF,NOZTYP,TDBUG,IONPRT
  COMMON/COM02/ FTAG,FTAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
  1 CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPC1,CP6,CPL,CPH,CPS,
  2 DELU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,FPS1,FPS2,EPST,
  3 EPSM2,EPSTN,EPSTU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
  4 GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,HDNX,HLM,HM,HSM,HSTAG,
  5 HUPX,P,PRG,PSTAG,QUED,QUEH,R,RC,REP,RGAS,RHO,RHODNL,RHOST,RP,
  6 RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
  7 UG00,UG0DN,UG0UP,UGDNX,UGUPX,UP,UP0,UP0DN,UP0UP,UPDNX,UPUPX,UT,
  8 WPWG,X,X0,X00,X1,X2,X3,XF,XMAX,XT,XX
6  COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
  1 UGDN(500),UGTRL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
  2 WORK(33),XDN(500),XTBL(500),XUP(500)
7  COMMON/COM04/ CAY1,CAY2,CAY4,CAYR,CUE0,CUE1,CUE2,CUE4,CUER,DY1LST,
  1 EL0,EL1,EL2,EL4,GAMBAR,QUAN1,QUAN2,QUAN3,QUAN4,QUAN5,ELPMH,
  2 UTPR,RPLST
8  COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINFS,N,NDN,
  1 NTRY,NUP,NDEG,NPTS
9  KFLG4=0                                12550
10 FX=2721.6*QUFD*GMUG*(UG-UP)            12560
11 A=3.14159265*RRR                        12570
12 IF (KFLG3)130,14,130                    12580
13 130 IF (SIGMA)131,14,131                  12590
14 131 IF (X-X3)1312,1316,1312              12600
15 1312 DFX=FX-FX3                          12610
16 IF (DFX)1313,14,1315                    12620
17 1313 IF (DFX+.030*SIGMA)1315,1315,14    12630
18 1315 X1=X2                                12640
19 FX1=FX2                                  12650
20 X2=X3                                    12660
21 FX2=FX3                                  12670
22 X3=X                                      12680
23 1316 FX3=FX                              12690
24 IF (X1+10000.0)14,14,1318               12700
25 1318 IF (DFX)132,14,14                   12710
26 132 KFLG4=1                              12720
27 A1=FX1/(X1-X2)/(X3-X1)                  12730
28 A2=FX2/(X2-X3)/(X1-X2)                  12740
29 A3=FX3/(X3-X1)/(X2-X3)                  12750
30 A=-A1-A2-A3                             12760
31 ABSA1=DABS(A1)
32 ABSA2=DABS(A2)
33 ABSA3=DABS(A3)
34 IF (ABSA2-ABSA1)1342,1342,134           12800
35 134- ABSA1=ABSA2                          12810
36 1342 IF (ABSA3-ABSA1)1346,1346,1344     12820
37 1344 ABSA1=ABSA3                          12830
38 1346 ABSA=DABS(A)
39 IF (ABSA/ABSA1-.01)135,136,136          12850
40 135 XEXTR=X2                             12860
41 SIGX=FX2                                12870

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42 1358 GO TO 14 12880
43 136 B=A1*(X2+X3)+A2*(X3+X1)+A3*(X1+X2) 12890
44 C=-A1*X2+X3-A2*X3+X1-A3*X1+X2 12900
45 XEXTR=-0.5*B/A 12910
46 138 SIGX=C+XEXTR*(B+XEXTR*A) 12920
47 14 GMACH=DSORT(SORM)
48 IF (KFLG3)142,180,142 12940
49 142 IF (SIGMA)180,144,180 12950
50 144 ARTIO=(R/RTH)**2 12960
51 UPOUG=UP/UG 12970
52 TGOUP=TG/TP 12980
53 RHOU=RHO*UG 12990
54 Q1=CNST6/RHOU 13000
55 Q2=RHO*UG+WPWG*UP 13010
56 VACI=Q1*(144.0*P*G+Q2) 13020
57 OPTI=Q1*Q2 13030
58 145 RHOGQ=RHO/RHOST 13040
59 RHOPQ=RHOGQ/UPOUG 13050
60 PGQ=P/PSTAG 13060
61 A=3.14159265*R*R 13070
62 WG=RHO*U*A 13080
63 KOUNT = 25 13090
64 150 GO TO (151,159,163),NLSW 13100
65 151 IF (XT-X-.001)154,154,152 13110
66 152 IF (UT-UG-100.0)153,153,157 13120
67 153 UI=UT-100.0 13130
68 GO TO 158 13140
69 154 IF (X-XI-.001)174,174,155 13150
70 155 IF (UG-UT-100.0)156,156,157 13160
71 156 UI=UT+100.0 13170
72 GO TO 158 13180
73 157 UI=UG 13190
74 158 TI=TSTAG-0.5*CAY1*UI**2 13200
75 IF (UI.LE.0.0) UI=UT
76 IF (TI.LE.0.0) TI=TT
77 FUI=CAYR*DLOG(TI)*DLOG(ARTIO*UI)-CAY4
78 FPRUI=-CAY2*UI/TI+1.0/UI 13220
79 GO TO 167 13230
80 159 IF (UG-EL2MH-100.0)160,160,161 13240
81 160 UI=EL2MH+100.0 13250
82 GO TO 162 13260
83 161 UI=UG 13270
84 162 IF (UI.LE.0.0) UI=UT
85 FUI=DLOG(ARTIO*UI)-0.5*EL2*UI**2-EL4
86 FPRUI=1.0/UI-EL2*UI 13290
87 DELTH=EL0-0.5*EL1*UI**2 13300
88 TI=TM 13310
89 GO TO 167 13320
90 163 IF (UG-UTPR-100.0)164,164,165 13330
91 164 UI=UTPR+100.0 13340
92 GO TO 166 13350
93 165 UI=UG 13360
94 166 TI=CUE0-0.5*CUF1*UI**2 13370
95 IF (UI.LE.0.0) UI=UT
96 IF (TI.LE.0.0) TI=TT

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  97      FUI=CUEP*DLOG(TI)+DLOG(ARTIO*UI)-CUE4
  98      FPRUI=-CUEP*UI/TI+1.0/UI
  99      167 DELTU=-FUI/FPRUI
 100      UISAV = UI
 101      UI=UI+DELTU
 102      IF (UI,LT,0.0) UI = UISAV/2.0
 103      IF (DABS(DELTU) = 2.500) 169,169,168
 104      168 KOUNT=KOUNT+1
 105      IF (KOUNT),1682,168A,1686
 106      1682 UI=UG
 107      TI=TG
 108      GMNL=GMACH
 109      C      WRITE (6,1683)
 110      1683 FORMAT(5X,26HTOO MUCH ITERATION IN OPUT)
 111      GO TO 178
 112      1686 GO TO (158,162,166),NLSW
 113      169 GO TO (170,172,175),NLSW
 114      170 IF (TI-TM)171,171,175
 115      171 IF (WPWG)175,175,1712
 116      1712 NLSW=2
 117      KOUNT = 25
 118      GO TO 159
 119      172 IF (HLM-HSM+DELTH)173,173,175
 120      173 NLSW=3
 121      KOUNT = 25
 122      GO TO 163
 123      174 UI=UT
 124      TI=TSTAG-0.5*CAY1*UI**2
 125      175 USQ=UI*UI
 126      GMNL=DSQRT(USQ/CNST5/TI)
 127      U=UI
 128      T=TI
 129      RRTONL=CNST8/R**2/U
 130      PRTONL=RRTONL*T/TSTAG
 131      OPTINL=U/G
 132      VACINL=OPTINL+CNST7*T/U
 133      RTOIV=VACI/VACINL
 134      RTOIO=OPTI/OPTINL
 135      IF (IDNPRT.EQ.0) GO TO 261
 136      180 LINES = LINES-1
 137      IF (LINES) 20,20,24
 138      20 LINES=50
 139      22 WRITE (6,22)
 140      24 FORMAT(
 141      1  KD      KH      REP      M      UG      H      UP      TG      TP
 142      2  R1)
 143      24 WRITE (6,26)X,GMACH,UG,UP,TG,TP,QUED,QUEH,REP,CY(1),H,FX,P,A,R
 144      26 FORMAT (1H F9.5,F8.4,2F9.1,2F9.2,2F7.3,1PE10.2,0PF9.1,F10.0,4F8.3)
 145      261 IF (KFLG3)262,50,262
 146      262 IF (SIGMA)50,264,50
 147      264 WRITE ( 8)X,GMACH,ARTIO,UPOUG,TGOTF,VACI,UPTI,RHOGQ,RHOPQ,PGQ,WG
 148      WRITE ( 9)X,ARTIO,GMNL,U,T,VACINL,OPTINL,RRTONL,PRTONL ,RTOIV,RTOI
 149      10
 150      50 RETURN
 151      END

```

13390
13400
13410
13420
13430
13450
13460
13470
13480
13490
13500
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13540
13550
13560
13570
13580
13590
13600
13610
13620
13630
13640
13650
13660
13680
13690
13700
13710
13720
13730
13740
13750
13770
13790
13800
13810
13820
13830
13840
13860
13870
13880
13890
13900
13910

SYMBOL	-----	REFERENCES	-----
14	- 12 13 16 17 24 25 42 47*		
20	- 136 137*		
22	- 138WR 139*		
24	- 136 140*		
26	- 140WR 141*		
50	- 142 143 146*		
130	- 12 13*		
131	- 13 14*		
132	- 25 26*		
134	- 34 35*		
135	- 39 40*		
136	- 39 43*		
138	- 46*		
142	- 48 49*		
144	- 49 50*		
145	- 58*		
150	- 64*		
151	- 64 65*		
152	- 65 66*		
153	- 66 67*		
154	- 65 69*		
155	- 69 70*		
156	- 70 71*		
157	- 66 70 73*		
158	- 68 72 74* 111		
159	- 64 80* 117		
160	- 80 81*		
161	- 80 83*		
162	- 82 84* 111		
163	- 64 90* 121		
164	- 90 91*		
165	- 90 93*		
166	- 92 94* 111		
167	- 79 89 99*		
168	- 103 104*		
169	- 103 112*		
170	- 112 113*		
171	- 113 114*		
172	- 112 118*		
173	- 118 119*		
174	- 69 122*		
175	- 112 113 114 118 124*		
178	- 110 126*		
180	- 48 49 135*		
261	- 134 142*		
262	- 142 143*		
264	- 143 144*		
1312	- 14 15*		
1313	- 16 17*		
1315	- 16 17 18*		
1316	- 14 23*		
1318	- 24 25*		
1342	- 34 36*		

I N D E X

SUBROUTINE INPUT

PAGE 317

1344	-	36	37*						
1346	-	36	38*						
1358	-	42*							
1682	-	105	106*						
1683	-	109*							
1686	-	105	111*						
1712	-	114	115*						
A	-	11=	30=	38	45	46	61=	62	140WR
ABSA	-	38=	39						
ABSA1	-	31=	34	35=	36	37=	39		
ABSA2	-	32=	34	35					
ABSA3	-	33=	36	37					
ALPHA	-	5C0							
ARF	-	4C0							
ART10	-	50=	77	85	97	144WR	145WR		
ATAHL	-	6C0							
A1	-	27=	30	31	43	44			
A2	-	28=	30	32	43	44			
A3	-	29=	30	33	43	44			
H	-	43=	45	46					
BLOW	-	5C0							
C	-	44=	46						
CAYW	-	7C0	77						
CAY1	-	7C0	74	123					
CAY2	-	7C0	78						
CAY4	-	7C0	77						
CHEM	-	4C0							
CNST1	-	5C0							
CNST10	-	5C0							
CNST2	-	5C0							
CNST3	-	5C0							
CNST4	-	5C0							
CNST5	-	5C0	125						
CNST6	-	5C0	54						
CNST7	-	5C0	131						
CNST8	-	5C0	128						
CNST9	-	5C0							
* COM01	-	4*							
* COM02	-	5*							
* COM03	-	6*							
* COM04	-	7*							
* COM05	-	8*							
CPC6	-	5C0							
CPG	-	5C0							
CPL	-	5C0							
CPP	-	5C0							
CPS	-	5C0							
CUER	-	7C0	97						
CUE0	-	7C0	94						
CUE1	-	7C0	94						
CUE2	-	7C0	98						
CUE4	-	7C0	97						
CU60	-	4C0							
* DABS	-	31	32	33	38	103			
DELTH	-	87=	118						

2-318

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DELTU	99=	101	103		
DELU	500				
DENOM	500				
UFIX	15=	16	17	25	
DIFFQ	300				
DLOG	77	85	97		
DMOND	500				
DMONU	500				
DNLST	500				
DQMAX	500				
DSORT	47	125			
DUMAX	500				
DX	500				
DX0	500				
DY	600	140WR			
DY1LST	700				
EL0	700	87			
EL1	700	87			
EL2	700	85	86		
EL2MH	700	80	81		
EL4	700	85			
EPSM	500				
EPSM2	500				
EPSN	500				
EPSU	500				
EPS1	500				
EPS2	500				
ERROR	500				
ETAG	500				
ETAP	500				
EULST	500				
EXEN	400				
FCTR	500				
FPRUI	78=	86=	98=	99	
FUI	77=	85=	97=	99	
FX	10=	15	23	140WR	
FX1	500	19=	27		
FX2	500	19	21=	28	41
FX3	500	15	21	23=	29
G	500	56	130		
GAMBAR	700				
GAMMA	500				
GMACH	500	47=	108	140WR	144WR
GMNL	108=	125=	145WR		
GMSSP	500				
GMUG	500	10			
GMUS	500				
GNLST	500				
GNUM	500				
H	500	140WR			
HON	600				
HONX	500				
HLN	500	118			
HM	500				
HSM	500	118			

HSTAG	-	5C0				
HTBL	-	6C0				
HUP	-	6C0				
HUPX	-	5C0				
H0	-	5C0				
H0D	-	5C0				
H0U	-	5C0				
IDBUG	-	4C0				
IDNPRT	-	4C0	134			
IERP	-	8C0				
K	-	8C0				
KFLG1	-	8C0				
KFLG2	-	8C0				
KFLG3	-	8C0	12	48	142	
KFLG4	-	8C0	9=	26=		
KOUNT	-	63=	104=	105	116=	120=
LFLAG	-	8C0				
LINES	-	8C0	135=	136	137=	
N	-	8C0				
NDEG	-	8C0				
NDN	-	8C0				
THE VARIABLE= NLSW -IS USED BEFORE IT IS DEFINED						
NLSW	-	64	111	112	115=	119=
NOZTYP	-	4C0				
NPTS	-	8C0				
NTRY	-	8C0				
NUP	-	8C0				
OPTI	-	57=	133	144WR		
OPTINL	-	130=	131	133	145WR	
OPUT	-	1*				
P	-	5C0	56	60	140WR	
PARWT	-	4C0				
PGD	-	60=	144WR			
PRG	-	5C0				
PRINT	-	3*				
PROP	-	4C0				
PRIONL	-	129=	145WR			
PSTAG	-	5C0	60			
QUAN1	-	7C0				
QUAN2	-	7C0				
QUAN3	-	7C0				
QUAN4	-	7C0				
QUAN5	-	7C0				
QUEO	-	5C0	10	140WR		
QUEH	-	5C0	140WR			
Q1	-	54=	56	57		
Q2	-	55=	56	57		
R	-	5C0	11	50	61	128
RARC1	-	4C0				140WR
RARC2	-	4C0				
RC	-	5C0				
RCH	-	4C0				
RFP	-	5C0	140WR			
RETURN	-	146*				
RGAS	-	5C0				

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UPUP	-	6C0								
UPUPX	-	5C0								
UP0	-	5C0								
UP00N	-	5C0								
UP0UP	-	5C0								
USQ	-	124=	125							
UT	-	5C0	66	67	70	71	75	84	95	122
UTPR	-	7C0	90	91						
U0	-	5C0								
VACI	-	56=	132	144WR						
VACINL	-	131=	132	145WR						
WG	-	62=	144WR							
WORK	-	6C0								
WPWG	-	5C0	55	114						
WTMOLG	-	4C0								
X	-	5C0	14	22	65	69	140WR	144WR	145WR	
X0N	-	6C0								
XEXTR	-	40=	45=	46						
XF	-	5C0								
XLST	-	3C0								
XMAX	-	5C0								
XT	-	5C0	65	69						
XTRL	-	6C0								
XUP	-	6C0								
XX	-	5C0								
X0	-	5C0								
X00	-	5C0								
X1	-	5C0	18=	24	27	28	29	43	44	
X2	-	5C0	18	20=	27	28	29	40	43	44
X3	-	5C0	14	20	22=	27	28	29	43	44

```

1  SUBROUTINE PRECAL
2  IMPLICIT REAL*8 (A-H,O-Z)
3  COMMON/COM02/ FTAG,E(AP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
   1  CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCU,CPG,CPL,CPP,CPS,
   2  DELU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EPS1,FPS2,EPSM,
   3  EPSM2,EPSN,EPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
   4  GMSSP,GMUG,GMUS,GNLST,GNUM,H0,HOD,HOU,HDNX,HLM,HM,HSM,HSTAG,
   5  HUPX,P,PRG,PSTAG,QUED,QUEH,R,RC,REP,RGAS,RHO,RHONL,RHOST,RP,
   6  RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
   7  UG00,UG0DN,UG0UP,UGDNX,UGUPX,UP,UP0,UP0DN,UP0UP,UPDNX,UPUPX,UT,
   8  WPG,X,X0,X00,X1,X2,X3,XF,XMAX,XI,XX
4  COMMON/COM03/ ATABL(3),DY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
   1  UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
   2  WORK(33),XDN(500),XTBL(500),XUP(500)
5  ALPHA=0.6
6  ATABL(1)=0.001
7  CPL=8503.3
8  CPS=8610.7
9  DQMAX=7.5E+7
10 DUMAX=100000.0
11 DX0=0.001
12 EPS1=0.1
13 EPSM=0.008
14 EPSU=0.0
15 G=32.174
16 GMUS=0.00005
17 GMSSP=249.7
18 HLM=4.7944007
19 HSM=3.5978007
20 PSTAG=1000.0
21 RTABL(1)=0.000001
22 SIGMA=0.0
23 TM=4167.0
24 RETURN
25 END

```

SYMBOL	-----	REFERENCES	-----
ALPHA	- 3C0	5=	
ATARL	- 4C0	6=	
BLOW	- 3C0		
CNST1	- 3C0		
CNST10	- 3C0		
CNST2	- 3C0		
CNST3	- 3C0		
CNST4	- 3C0		
CNST5	- 3C0		
CNST6	- 3C0		
CNST7	- 3C0		
CNST8	- 3C0		
CNST9	- 3C0		
* COM02	- 3*		
* COM03	- 4*		
CPCG	- 3C0		
CPG	- 3C0		
CPL	- 3C0	7=	
CPP	- 3C0		
CPS	- 3C0	8=	
DELU	- 3C0		
DEMOM	- 3C0		
DMOND	- 3C0		
DMONU	- 3C0		
DNLST	- 3C0		
DQMAX	- 3C0	9=	
DUMAX	- 3C0	10=	
DX	- 3C0		
DX0	- 3C0	11=	
DY	- 4C0		
EPSM	- 3C0	13=	
EPSM2	- 3C0		
EPSN	- 3C0		
EPSU	- 3C0	14=	
EPS1	- 3C0	12=	
EPS2	- 3C0		
ERROR	- 3C0		
ETAG	- 3C0		
ETAP	- 3C0		
EULST	- 3C0		
FCTR	- 3C0		
FX1	- 3C0		
FX2	- 3C0		
FX3	- 3C0		
G	- 3C0	15=	
GAMMA	- 3C0		
GMACH	- 3C0		
GMSSP	- 3C0	17=	
GMUG	- 3C0		
GMUS	- 3C0	16=	
GNLST	- 3C0		
GNUM	- 3C0		
H	- 3C0		

I N D E X

SUBROUTINE PRECAL

PAGE 324

HDN - 4C0
 HDNX - 3C0
 HLM - 3C0 18=
 HM - 3C0
 HSM - 3C0 19=
 HSTAG - 3C0
 HTBL - 4C0
 HUP - 4C0
 HUPX - 3C0
 HQ - 3C0
 HQD - 3C0
 HQU - 3C0
 P - 3C0
 * PRECAL - 1*
 PRG - 3C0
 PSTAG - 3C0 20=
 QUEO - 3C0
 QUEH - 3C0
 R - 3C0
 RC - 3C0
 REP - 3C0
 * RETURN - 24*
 RGAS - 3C0
 RHO - 3C0
 RHOST - 3C0
 RHOONL - 3C0
 RP - 3C0
 RTAHL - 4C0 21=
 RTH - 3C0
 SIGMA - 3C0 22=
 SIGX - 3C0
 SQRM - 3C0
 TAU - 3C0
 TAUG - 3C0
 TG - 3C0
 TGD - 3C0
 TM - 3C0 23=
 TP - 3C0
 TSTAG - 3C0
 TT - 3C0
 UG - 3C0
 UGDN - 4C0
 UGDNX - 3C0
 UGTBL - 4C0
 UGUP - 4C0
 UGUPX - 3C0
 UGQ - 3C0
 UGQDN - 3C0
 UGQUP - 3C0
 UGQD - 3C0
 UP - 3C0
 UPDN - 4C0
 UPDNX - 3C0
 UPTBL - 4C0
 UPUP - 4C0

I A D F X

SUBROUTINE PRECAL

PAGE 325

UPUPX	-	3C0
UPD	-	3C0
UPDDN	-	3C0
UPDIP	-	3C0
UT	-	3C0
UD	-	3C0
WDRK	-	4C0
WPWG	-	3C0
X	-	3C0
XDN	-	4C0
Xf	-	3C0
XMAX	-	3C0
XT	-	3C0
XTBL	-	4C0
XUP	-	4C0
XX	-	3C0
X0	-	3C0
X00	-	3C0
X1	-	3C0
X2	-	3C0
X3	-	3C0

.....

I N D E X

FUNCTION RADIUS(Z)

PAGE 326

1	FUNCTION RADIUS(Z)	8340
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	COMMON/COM05/ IFRR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINES,N,NDN,	
	1 NTRY,NUP,NDEG,NPTS	
4	COMMON/COM06/ AOD,A(9),RL(200),XL(200),HDELT,RAMDER,RMDRK,AR,	
	1 RTHRT,XSAVE	
5	CALL GETAS(Z)	8400
6	RADIUS=A(NDEG+1)	8410
7	J=NDEG	8420
8	DO 20 I=1,NDEG	8430
9	RADIUS=RADIUS*7+A(J)	8440
10	20 J=J-1	8450
11	RETURN	8460
12	END	8470

SYMBOL	-----	REFERENCES	-----
20	-	800	10*
A	-	400	6
AOD	-	400	9
AR	-	400	
* COM05	-	3*	
* COM06	-	4*	
* GETAS	-	5*	
MDFLT	-	400	
I	-	800	
IERR	-	300	
J	-	7=	9
N	-	300	10=
KFLG1	-	300	
KFLG2	-	300	
KFLG3	-	300	
KFLG4	-	300	
LFLAG	-	300	
LINF5	-	300	
N	-	300	
NDEG	-	300	6
NDN	-	300	7
NPTS	-	300	800
NTRY	-	300	
NUP	-	300	
* RADIUS	-	1*	6=
* RAMDER	-	400	9=
* RETURN	-	11*	
RL	-	400	
KMDRK	-	400	
RTHRT	-	400	
XL	-	400	
XSAVE	-	400	
Z	-	1AG	SAG

```

1  SUBROUTINE REPLCE(L)
2  IMPLICIT REAL*8 (A-H,O-Z)
   C
   C  L=1, REPLDN
   C  L=2, REPLUP
   C
3  COMMON/COM02/ ETAG,ETAP,H,ALPHA,BLOW,CNST1,CNST2,CNST3,CNST4,
   1  CNST5,CNST6,CNST7,CNST8,CNST9,CNST10,CPCG,CPG,CPL,CPD,CPS,
   2  OFLU,DENOM,DMOND,DMONU,DNLST,DQMAX,DUMAX,DX,DX0,EP51,FPS2,FPSM,
   3  EPSM2,EPSN,FPSU,ERROR,EULST,FCTR,FX1,FX2,FX3,G,GAMMA,GMACH,
   4  GMSSP,GMUG,GMUS,GNLST,GNUM,H0,H0D,H0U,H0NX,HLM,HH,HSM,HSTAG,
   5  HUPX,P,PHG,PSTAG,QUEO,QUEH,R,RC,REP,RGAS,RHO,RH00NL,RHOST,RP,
   6  RTH,SIGMA,SIGX,SORM,TAU,TAUG,TG,TG0,TM,TP,TSTAG,TT,U0,UG,UG0,
   7  UG0D,UG0DN,UG0UP,UG0NX,UG0PX,UP,UP0,UP0DN,UP0UP,UP0NX,UP0PX,UT,
   8  WPWG,X,X0,X0D,X1,X2,X3,XF,XMAX,XT,XX
   4  COMMON/COM03/ ATABL(3),OY(3),HDN(500),HTBL(500),HUP(500),RTABL(3),
   1  UGDN(500),UGTBL(500),UGUP(500),UPDN(500),UPTBL(500),UPUP(500),
   2  WORK(33),XDN(500),XTBL(500),XUP(500)
   5  COMMON/COM05/ IERR,K,KFLG1,KFLG2,KFLG3,KFLG4,LFLAG,LINFS,N,NDN,
   1  NTRY,NUP,NDEG,NPTS
   6  GO TO (10,30),L
   7  10 UG0DN=UG0
   8  UP0DN=UP0
   9  H0D=H0
  10  NDN=N
  11  DO 20 I=1,NDN
  12  XDN(I)=XTBL(I)
  13  UGDN(I)=UGTBL(I)
  14  UPDN(I)=UPTBL(I)
  15  HDN(I)=HTBL(I)
  16  RETURN
  17  30 UG0UP=UG0
  18  UP0UP=UP0
  19  H0U=H0
  20  NUP=N
  21  DO 40 I=1,NUP
  22  XUP(I)=XTBL(I)
  23  UGUP(I)=UGTBL(I)
  24  UPUP(I)=UPTBL(I)
  25  40 HUP(I)=HTBL(I)
  26  RETURN
  27  END

```

3660

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3700

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4240

4250

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4290

4300

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4330

SYMBOL	REFERENCES
10	6 7*
20	1100 15*
30	6 17*
40	2100 25*
ALPHA	3C0
ATARL	4C0
BLOW	3C0
CNST1	3C0
CNST10	3C0
CNST2	3C0
CNST3	3C0
CNST4	3C0
CNST5	3C0
CNST6	3C0
CNST7	3C0
CNST8	3C0
CNST9	3C0
* COM02	3*
* COM03	4*
* COM05	5*
CPCG	3C0
CPG	3C0
CPL	3C0
CPP	3C0
CPS	3C0
DELU	3C0
DENOM	3C0
DMOND	3C0
DMONU	3C0
UNLST	3C0
DQMAX	3C0
DUMAX	3C0
DX	3C0
DX0	3C0
DY	4C0
EPSM	3C0
EPSM2	3C0
EPSN	3C0
EPSU	3C0
EPS1	3C0
EPS2	3C0
ERROR	3C0
ETAG	3C0
ETAP	3C0
EULST	3C0
FCTR	3C0
FX1	3C0
FX2	3C0
FX3	3C0
G	3C0
GAMMA	3C0
GMACH	3C0
GMSSP	3C0

I N D E X

SUBROUTINE REPLCE(L)

PAGE 330

GHUG	-	300																		
GMUS	-	300																		
GNLST	-	300																		
GNUM	-	300																		
H	-	300																		
HON	-	400	15=																	
HONX	-	300																		
HLM	-	300																		
HM	-	300																		
HSM	-	300																		
HSTAG	-	300																		
HTHL	-	400	15	25																
HUP	-	400	25=																	
HUPX	-	300																		
HQ	-	300	9	19																
HOD	-	300	9=																	
HOU	-	300	19=																	
I	-	1100	12	13	14	15	2100	22	23	24	25									
IERR	-	500																		
K	-	500																		
KFLG1	-	500																		
KFLG2	-	500																		
KFLG3	-	500																		
KFLG4	-	500																		
L	-	1AG	6																	
LFLAG	-	500																		
LINES	-	500																		
N	-	500	10	20																
NDEG	-	500																		
NDN	-	500	10=	1100																
NPTS	-	500																		
NTRY	-	500																		
NUP	-	500	20=	2100																
P	-	300																		
PRG	-	300																		
PSTAG	-	300																		
QUED	-	300																		
QUEH	-	300																		
R	-	300																		
RC	-	300																		
REP	-	300																		
* REPLCE	-	1*																		
* RETURN	-	16*	26*																	
RGAS	-	300																		
RHO	-	300																		
RHOST	-	300																		
RHOONL	-	300																		
RP	-	300																		
RTARL	-	400																		
RTH	-	300																		
SIGMA	-	300																		
SIGX	-	300																		
SORM	-	300																		
TAU	-	300																		
TAUG	-	300																		

I N D E X

SUBROUTINE REPLCE(L)

PAGE 331

T6	-	3C0		
T60	-	3C0		
TM	-	3C0		
TP	-	3C0		
TSTAG	-	3C0		
TT	-	3C0		
UG	-	3C0		
UGDN	-	4C0	13=	
UGDNX	-	3C0		
UGTRL	-	4C0	13	23
UGUP	-	4C0	23=	
UGUPX	-	3C0		
UG0	-	3C0	7	17
UG0DN	-	3C0	7=	
UG0UP	-	3C0	17=	
UG00	-	3C0		
UP	-	3C0		
UPDN	-	4C0	14=	
UPDNX	-	3C0		
UPTRL	-	4C0	14	24
UPUP	-	4C0	24=	
UPUPX	-	3C0		
UP0	-	3C0	8	18
UP0DN	-	3C0	8=	
UP0UP	-	3C0	18=	
UT	-	3C0		
U0	-	3C0		
WORK	-	4C0		
WPWG	-	3C0		
X	-	3C0		
XDN	-	4C0	12=	
XF	-	3C0		
XMAX	-	3C0		
XT	-	3C0		
XTBL	-	4C0	12	22
XUP	-	4C0	22=	
XX	-	3C0		
X0	-	3C0		
X00	-	3C0		
X1	-	3C0		
X2	-	3C0		
X3	-	3C0		

```

1      SUBROUTINE RKSF4 (DERIV,CNTRL,/Y/,/DY/,/ATAB/,/RTAB/,/W/,/X/,/DX/,
2      $ N,IFVD,IBKP,/NTRY/,/IERR/)
3      IMPLICIT REAL*8 (A-H,O-Z)
4      COMMON /CDX4/ DX4
5      COMMON /BOB/ KFLG
6      COMMON /CHPNT/CHANGF,XTH,FR10,KPRNT
7      DIMENSION Y(3),DY(3),ATAB(3),RTAB(3),W(33)
8      DIMENSION SRTAB(3)
9      DATA ICNT/??/
10     - DATA CON2/1.E-07/,IFLAG/0/
11     - DATA NN,N1,N2,N3,N4,N5/3,6,9,12,15,18/
12     - DO 991 I=1,3
13     991 SRTAB(I)=RTAB(I)
14     INDEX=0
15     XSAV=X
16     1 XST = X
17     DXST = DX
18     IERR=0
19     OXTH=0,0
20     INTR = 0
21     IF (DXST) 3,2,3
22     2 IERR = -1
23     100 KFLG = 1
24     DO 1000 I=1,3
25     1000 RTAB(I)=SRTAB(I)
26     RETURN
27     3 CONTINUE
28     10 NTRY=1
29     C CLEAR WORK AREA
30     DO 11 I=2,21
31     11 W(I) = 0.
32     W(1) = DX
33     CALL DERIV
34     KSTAT = 11
35     IF (KPRNT,LT,99) GO TO 110
36     WRITE (6,120) KSTAT
37     120 FORMAT (12H CALL CNTRL,1I4)
38     WRITE (6,121)DX,DXST,TEMP1,TEMP,DX4,DX2,E*FLAG,Y,DY,ATAB,RTAB,W
39     121 FORMAT (5(2X,1E15,9))
40     110 CONTINUE
41     IF (KPRNT,GT,99) WRITE (6,122)NTRY,FLAG,INTR,IBKP
42     CALL CNTRL(NTRY)
43     IF (KPRNT,GT,99) WRITE (6,122)NTRY,FLAG,INTR,IBKP
44     122 FORMAT (7H NTRY=,1I3,2X,6HFLAG =,1F6,2,6X,6HINTR =,1I3,2X,6HIBKP
45     1=,1I3)
46     IF (NTRY-2) 13,100,12
47     12 IERR=2
48     KFLG = 1
49     RETURN
50     13 CONTINUE
51     15 W(2)=X
52     150 DO 16 I=1,NN
53     K=1+N2
54     W(1+3)=Y(I)
55     W(K)=DY(I)

```

18280

18300

18320

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18350

18410

18450

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18540

18550

18580

18700

18720

18740

18750

18760

18770

18780

18790

18800

18840

18850

18860

18870

18880

18890

18900

18910

18920

18930

18970

19070

19080

19090

19100

53	16 CONTINUE	19110
54	17 DX4=DX/4.	19120
55	DX2=DX/2.	19130
56	NTRY=1	19140
57	160 DO 170 I=1,NN	19300
58	L=I+NS	19310
59	W(L)=DY(I)*DX4	19320
60	Y(I)=W(I+3)+W(L)	19330
61	170 CONTINUE	19340
62	X=X+DX4	19350
63	CALL DERIV	19360
64	DO 175 I=1,NN	19370
65	175 Y(I)=DX4*DY(I) + W(I+3)	19380
66	18 DO 19 I=1,NN	19400
67	J=I+NS	19410
68	W(J)= DX2*DY(I) + W(J)	19420
69	19 CONTINUE	19430
70	CALL DFRIV	19440
71	DO 20 I=1,NN	19450
72	K=I+NS	19460
73	TEMP = DX2*DY(I)	19470
74	Y(I)=TEMP + W(I+3)	19480
75	W(K) = TEMP + W(K)	19490
76	20 CONTINUE	19500
77	GO TO 30	19510
78	21 DO 22 I=1,NN	19520
79	J=I+NS	19530
80	W(J)= DX*DY(I) + W(J)	19540
81	22 CONTINUE	19550
82	30 X = X+DX4	19560
83	CALL DERIV	19570
84	DO 31 I=1,NN	19580
85	J=I+NS	19590
86	W(J) = (DX4*DY(I) + W(J))/3.	19600
87	Y(I) = W(J) + W(I+3)	19610
88	31 CONTINUE	19620
89	313 CALL DERIV	19640
90	314 IF (ICNT-1) 33,33,315	19650
91	315 W(3)=W(2)	19660
92	DO 32 I=1,NN	19670
93	J=I+N1	19680
94	K=I+N2	19690
95	L=I+N3	19700
96	M=I+N4	19710
97	NN=I+NS	19720
98	W(J)=W(I+3)	19730
99	W(L)=W(K)	19740
100	W(M)=W(MM)	19750
101	32 CONTINUE	19760
102	ICNT = ICNT-1	19770
103	GO TO 15	19780
104	33 ICNT = 2	19790
	C COMPUTE RATIOS AND FIND MAXIMUM FOR AUTOMATIC INTERVAL ADJUSTMENT	19830
105	35 E=0.	19840
106	DO 38 I=1,NN	19850

```

107      J=I+N5                                19860
108      K=I+N4                                19870
109      M=I+N2                                19880
110      L=I+N3                                19890
111      TEMP1 = DABS(RTAB(I)*Y(I)) + DABS(ATAB(I))
112      IF(TEMP1) 68,68,36                      19910
113      36 TEMP = W(K) + W(J) = (((4.*W(M) + W(L) + DY(I))/6.)*DX) 19920
114      TEMP = DABS(TEMP)/TEMP1
115      IF(TEMP-E) 38,38,37                      19940
116      37 E=TEMP                                19950
117      INDEX=I                                19960
118      38 CONTINUE                            19970
119      W(1) = DX                                19980
120      IF(E.GT.1.) GO TO 54
121      IF(E.GT..75) GO TO 49                    20000
122      IF(E.GE..075) GO TO 40                  20010
123      C INCREASE DX AND CONTINUE              20020
124      KFLG = 1                                20030
125      DX = DX*FR10                            20040
126      40 CONTINUE                            20050
127      405 DO 41 I=1,NN                      20060
128      .. K=I+N1                                20070
129      .. Z1=W(K)                              20080
130      .. Z2=Y(I)                              20090
131      C TEST FOR CHANGE IN HIGH ORDER Y VALUES 20100
132      IF(Z1.EQ.Z2) GO TO 41                  20110
133      IFLAG = 1                                20120
134      41 CONTINUE                            20130
135      Z1 = W(3)                              20140
136      Z2 = X                                20150
137      IF (Z1.EQ.Z2) GO TO 42                  20160
138      IFLAG=1                                20170
139      42 IF (IFLAG.EQ.0) GO TO 2              20180
140      IFLAG = 0                                20190
141      W(N4+1)=INDEX                          20200
142      W(N4+2)=E                              20210
143      KSTAT = 44                             20220
144      IF(KPRNT.LT.99) GO TO 43               20230
145      WRITE (6,120) KSTAT                    20240
146      WRITE (6,121)DX,DXST,TEMP1,TEMP,DX4,DX2,E,FLAG,Y,DY,ATAB,RTAB,W 20250
147      43 CONTINUE                            20280
148      44 CONTINUE                            20290
149      IF (KPRNT.GT.99) WRITE(6,122)NTRY,FLAG,INTR,IBKP 20300
150      CALL CNTRL(NTRY)                      20310
151      IF (KPRNT.GT.99) WRITE(6,122)NTRY,FLAG,INTR,IBKP 20320
152      440 IF(NTRY-3) 45,52,1                 20340
153      45 IF(NTRY-1) 13,13,100                20350
154      46 IF(INTR.NE.0) GO TO 47              20360
155      DXTM=DX                                20380
156      INTR = 1
157      47 DX = 0.0
158      GO TO 52
159      48 IF(NTRY.EQ.4) GO TO 1                20410
160      IF (DXTM.NE.0.) DX=DXTM                20420
161      GO TO 440

```

160	C DECREASE DX AND CONTINUE	20460
161	49 DX = DX/FR10	20470
	GO TO 40	20480
162	C REPEAT LAST STEP	20520
163	52 X = W(3)	20530
164	W(2) = X	20540
165	DO 53 I=1,NN	20550
166	J=I+N1	20560
167	K=I+N2	20570
168	L=I+N3	20580
169	Y(I) = W(J)	20590
170	W(I+3) = Y(I)	20600
171	DY(I) = W(L)	20610
172	W(K) = DY(I)	20620
173	53 CONTINUE	20630
174	GO TO 17	20640
175	54 E = E/10.	20650
176	DX = DX/FR10	20660
177	IF (E.LT.1.) GO TO 52	20670
178	GO TO 54	20680
179	60 TEMP1 = XST + DXST	20690
180	TEMP = DABS((TEMP1-X)/X)	
181	IF (TEMP.GT.CON2) GO TO 15	20710
182	KSTAT = 61	20720
183	IF (KPRNT.LT.99) GO TO 610	20730
184	WRITE (6,120) KSTAT	20740
185	WRITE (6,121) DX,DXST,TEMP1,TEMP,DX4,DX2,E,FLAG,Y,DY,ATAB,RTAB,W	
186	610 CONTINUE	20770
187	IF (KPRNT.GT.99) WRITE (6,122) NTRY,FLAG,INTR,IBKP	20780
188	61 CALL CNTRL(NTRY)	20790
189	IF (KPRNT.GT.99) WRITE (6,122) NTRY,FLAG,INTR,IBKP	20800
190	IF (NTRY-3) 62,52,1	20810
191	62 IF (NTRY.GT.1) GO TO 100	20820
192	63 XST = XST + DXST	20830
193	65 DX = W(1)	20840
194	GO TO 13	20850
195	66 IERR = 1	20860
196	KFLG = 1	20870
197	DO 1002 I=1,3	
198	1002 RTAB(I)=SRTAB(I)	20900
199	RETURN	20910
	END	

SYMBOL	-----	REFERENCES	-----
1	-	15*	150 157 189
2	-	20 21*	137
3	-	20 26*	
10	-	27*	
11	-	2800 29*	
12	-	43 44*	
13	-	43 47*	151 193
15	-	48* 103	180
16	-	4900 53*	
17	-	54* 173	
18	-	66*	
19	-	6600 69*	
20	-	7100 76*	
21	-	78*	
22	-	7800 81*	
30	-	77 82*	
31	-	8400 88*	
32	-	9200 101*	
33	-	90 104*	
35	-	105*	
36	-	112 113*	
37	-	115 116*	
38	-	10600 115 118*	
40	-	122 125*	161
41	-	12600 130 132*	
42	-	135 137*	
43	-	142 145*	
44	-	146*	
45	-	150 151*	
46	-	152*	
47	-	152 155*	
48	-	157*	
49	-	121 160*	
52	-	150 156 162*	176 189
53	-	16400 172*	
54	-	120 174*	177
60	-	178*	
61	-	187*	
62	-	189 190*	
63	-	191*	
65	-	192*	
68	-	112 194*	
100	-	22* 43 151 190	
110	-	33 38*	
120	-	34WR 35* 143WR 183WR	
121	-	36WR 37* 144WR 184WR	
122	-	39WR 41WR 42* 147WR 149WR 186WR 188WR	
150	-	49*	
160	-	57*	
170	-	5700 61*	
175	-	6400 65*	
313	-	89*	
314	-	90*	

0256-10020-7

I N D E X

SUBROUTINE RKSF4 (DERIV, CNTRL, /Y/, /DY/, /ATAB/, /RTAH/, /W/, /X/, /DX/;

PAGE 338

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N2      - 100A 50 94 109 166
N3      - 100A 95 110 167
N4      - 100A 96 108 139 140
N5      - 100A 58 67 72 79 85 97 107
* RETURN - 25* 46* 198*
* RKSF4  - 1*
RTAB     - 1AG 60I 12 24= 36WR 111 144WR 184WR 197=
SRTAB    - 70I 12= 24 197
      THE VARIABLE= TEMP -IS USED BEFORE IT IS DEFINED
TEMP     - 36WR 73= 74 75 113= 114= 115 116 144WR 179= 180 184WR
      THE VARIABLE= TEMP1 -IS USED BEFORE IT IS DEFINED
TEMP1    - 36WR 111= 112 114 144WR 178= 179 184WR
W        - 1AG 60I 29= 30= 36WR 48= 51= 52= 59= 60 65 68= 74
      75= 80= 86= 87 91= 98= 99= 100= 113 119= 128 133 139=
      140= 144WR 162 163= 168 169= 170 171= 184WR 192
X        - 1AG 14 15 48 62= 82= 134 162= 163 179
XSAV     - 14=
XST      - 15= 178 191=
ATH      - 500
Y        - 1AG 60I 36WR 51 60= 65= 74= 87= 111 129 144WR 168= 169
      184WR
Z1       - 128= 130 133= 135
Z2       - 129= 130 134= 135

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1		SUBROUTINE ROOTS4(A,B,FUNCT,ABSX,RELX,ABSY,N,ISOLN,SOLN)	9380
2		IMPLICIT REAL*8 (A-H,O-Z)	
3		EXTERNAL FUNCT	9390
4		DIMENSION SOLN(2)	9400
5		REAL LOWER	9410
6		ERR=0.	9420
7		EFLG=0.	9430
8		ROOT1=0.	9440
9		ROOT2=0.	9450
10		TWODLT=0.0	9460
11		IF (R-A)20,130,22	9470
12	20	LOWER=B	9480
13		UPPER=A	9490
14		GO TO 24	9500
15	22	LOWER=A	9510
16		UPPER=B	9520
17	24	FXUP=FUNCT(UPPER)	9530
18		IF (FXUP.NE.0.) GO TO 245	9540
19		X1=UPPER	9550
20		GO TO 150	9560
21	245	FXLO=FUNCT(LOWER)	9570
22		IF (FXLO.NE.0.) GO TO 25	9580
23		X1=LOWER	9590
24		GO TO 150	9600
25	25	IF (N.LE.20) GO TO 26	9610
26		ISOLN=5	9620
27		GO TO 150	9630
28	26	DLTA=UPPER-LOWER	9640
29		DXMIN=DLTA/2.*N	9650
30		TWOPCT=0.02*DLTA	9660
31		FHNDY=0.02*TWOPCT	9670
32		IF (FXLO/FXUP.LE.0.) GO TO 50	9680
33		DLTA=0.5*DLTA	9690
34		J=1	9700
35		ABSUP = DARS(FXUP)	
36		ABSL0 = DARS(FXLO)	
37		ABSYMN=ABSL0	9730
38		XATYMN=LOWFR	9740
39		YMN=FXLO	9750
40		IF (ABSL0.LE.ABSUP) GO TO 29	9760
41		ABSYMN=ABSUP	9770
42		XATYMN=UPPER	9780
43		YMN=FXUP	9790
44	29	ROOT1=XATYMN	9800
45		ROOT2=YMN	9810
46		GO TO 32	9820
47	30	J=2*J	9830
48	32	FLAST=FXLO	9840
49		XLAST=LOWER	9850
50		X=XLAST+DLTA	9860
51		DO 36 I=1,J	9870
52		FOFX=FUNCT(X)	9880
53		IF (FOFX/FLAST)40,56,34	9890
54	34	FLAST=FOFX	9900
55		XLAST=X	9910

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56      ABSYC=DABS(FOFX)
57      IF (ABSYC.GT.ABSYMN) GO TO 36
58      ABSYMN=ABSYC
59      XATYMN=X
60      YMN=FOFX
61      36  X=XLAST+TWODLT
62          TWODLT=DLTA
63          DLTA=0.5*DLTA
64          IF (DLTA.GE.DXMIN) GO TO 30
65          IF (XATYMN.EQ.LOWER.OR.XATYMN.EQ.UPPER) GO TO 395
66          XLO=XATYMN-TWODLT
67          YLO=FUNCT(XLO)
68          XM=XATYMN
69          YM=YMN
70          XUP=XATYMN+TWODLT
71          YUP=FUNCT(XUP)
72      37  DX1=XM-XUP
73          DX2=XUP-XLO
74          DX3=XLO-XM
75          T1=YLO/DX3/DX2
76          T2=YM/DX1/DX3
77          T3=YUP/DX2/DX1
78          AA=-T1-T2-T3
79          IF (AA.EQ.0.) GO TO 39
80          BB=T1*(XM+XUP)+T2*(XUP+XLO)+T3*(XLO+XM)
81          X=-0.5*(B+AA)
82          IF (X.LE.XLO.OR.X.GE.XUP) GO TO 39
83          FOFX=FUNCT(X)
84          DLTA=XUP-X
85          XLAST=XLO
86          FLAST=YLO
87          IF (FOFX/YLO) 40,56,38
88      38  IF (DABS(YM).LE.DABS(FOFX)) GO TO 384
89          IF (X.GT.XM) GO TO 382
90          XUP=XM
91          YUP=YM
92      381  XM=X
93          YM=FOFX
94          GO TO 37
95      382  XLO=XM
96          YLO=YM
97          GO TO 381
98      384  IF (X.GT.XM) GO TO 386
99          XLO=X
100         YLO=FOFX
101         GO TO 37
102      386  XUP=X
103         YUP=FOFX
104         GO TO 37
105      39  X=XLO
106         FOFX=YLO
107         IF (DABS(YM).GT.DABS(FOFX)) GO TO 391
108         X=XM
109         FOFX=YM
110      391  IF (DABS(YUP).GE.DABS(FOFX)) GO TO 392

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111		X=XUP	10470
112		F0FX=YUP	10480
113	342	IF (DABS(F0FX).LE.ABSY) GO TO 56	
114		ROOT1=X	10500
115		ROOT2=F0FX	10510
116	395	ISOLN=0	10520
117		GO TO 150	10530
118	40	ISOLN=2	10540
119		XLO=X	10550
120		YLO=F0FX	10560
121		XUP=X+1.0001*DLTA	10570
122		IF (XUP.GE.UPPFR) GO TO 42	10580
123		YUP=FUNCT(XUP)	10590
124		GO TO 44	10600
125	42	XUP=UPPLR	10610
126		YUP=FXUP	10620
127	44	KRF1=1	10630
128		GO TO 70	10640
129	46	ROOT2=XI	10650
130		XLO=XLAST	10660
131		YLO=FLAST	10670
132		XUP=X	10680
133		YUP=F0FX	10690
134		GO TO 52	10700
135	50	ISOLN=1	10710
136		XLO=LOWER	10720
137		YLO=FXLO	10730
138		XUP=UPPER	10740
139		YUP=FXUP	10750
140	52	KRET=2	10760
141		GO TO 70	10770
142	54	ROOT1=XI	10780
143		GO TO 150	10790
144	56	IF (X.EQ.0.) GO TO 62	10800
145		XPLE=X	10810
146		FACTR=1.0001	10820
147		JRET=1	10830
148		GO TO 66	10840
149	58	XPLE=X	10850
150		FACTR=0.9999	10860
151		JRET=2	10870
152		GO TO 66	10880
153	60	ISOLN=2	10890
154		ROOT1=X	10900
155		ROOT2=X	10910
156		YI=FUNCT(X)	10920
157		GO TO 150	10930
158	62	EPS=0.0001*(UPPER-LOWER)	10940
159		XPLE=EPS	10950
160		FACTR=1.0001	10960
161		JRET=3	10970
162		GO TO 66	10980
163	64	XPLE=-EPS	10990
164		JRET=4	11000
165	66	XPLE=FACTR*XPLE	11010

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106     FXPLE=FUNCT(XPLE)
107     IF (FXPLE.EQ.0.) GO TO 66
108     IF ((FXPLE/FLAST).LT.0.) GO TO 68
109     GO TO (58,60,64,60),JRET
110 68     X=XPLE
111     FOFX=FXPLE
112     GO TO 40
113 70     IF (YLO.NE.0.) GO TO 72
114     XI=XLO
115     GO TO 118
116 72     IF (YUP.NE.0.) GO TO 74
117     XI=XUP
118     GO TO 118
119 74     DLAST=1.E+38
120 76     CALL OVERFL(L)
121     DLTAX=XLO-XUP
122     XI=XUP+YUP*DLTAX/(YUP-YLO)
123     FRACT=(XI-XUP)/DLTAX
124     CALL OVERFL(L)
125     IF (L.EQ.1) GO TO 132
126     FLAG=0.
127     IF (FRACT.GT.0.02) GO TO 78
128     FLAG=1.
129     XI=XUP
130     YI=YUP
131     GO TO 82
132 78     IF (FRACT.LT.0.98) GO TO 80
133     FLAG=-1.
134     XI=XLO
135     YI=YLO
136     GO TO 82
137 80     YI=FUNCT(XI)
138     IF (YI.EQ.0.) GO TO 119
139 82     IF (FLAG.EQ.0.) GO TO 86
140     DLTAX=XUP-XLO
141     IF (DLTAX.GT.TWOPCT) GO TO 86
142     DLTAX=0.10*DLTAX
143     IF (FLAG.LT.0.) GO TO 84
144     XM=XUP-DLTAX
145     GO TO 92
146 84     XM=XLO+DLTAX
147     GO TO 92
148 86     IF ((DLTAX+FHNDT).GT.0.) GO TO 88
149     XM=0.5*(XUP+XLO)
150     FRACT=DABS(XM-XI)/DLTAX
151     IF (FRACT.GT.0.1) GO TO 92
152 88     IF (YI.LT.0.) GO TO 90
153     IF (YLO)108,110,110
154 90     IF (YLO)110,108,108
155 92     YM=FUNCT(XM)
156     IF (YM.EQ.0.) GO TO 120
157     DX=XM-XI
158     IF ((YM/YI).LT.0.) GO TO 96
159     IF (YM.LT.0.) GO TO 94
160     IF (YLO)102,100,100

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221	94	IF (YLO)100,102,102	11570
222	96	IF (DX.LT.0.) GO TO 98	11580
223		XLO=XI	11590
224		YLO=YI	11600
225		GO TO 104	11610
226	98	XLO=XM	11620
227		YLO=YM	11630
228		GO TO 108	11640
229	100	IF (DX)110,106,106	11650
230	102	IF (DX)104,104,108	11660
231	104	XUP=XM	11670
232		YUP=YM	11680
233		GO TO 112	11690
234	106	XLO=XM	11700
235		YLO=YM	11710
236		GO TO 112	11720
237	108	XUP=XI	11730
238		YUP=YI	11740
239		GO TO 112	11750
240	110	XLO=XI	11760
241		YLO=YI	11770
242	112	DLTA=XLO-XUP	11780
243		IF ((DLTA+ABSX).GT.0.) GO TO 116	11790
244		IF (DLTA.NF.DLAST) GO TO 114	11800
245		EFLG=1.	11810
246		GO TO 116	11820
247	114	DLAST=DLTA	11830
248		XMAG=DMAX1 (DABS(XLO),DABS(XUP))	
249		IF ((DLTA/XMAG+RELX).GT.0.) GO TO 116	11840
250		IF ((ABSY-DABS(YUP)).GT.0.0) GO TO 116	
251		IF ((ABSY-DABS(YLO)).LT.0.0) GO TO 76	
252	116	XI=XUP+YUP*(XLO-XUP)/(YUP-YLO)	11880
253	118	YI=FUNCT(XI)	11890
254	119	GO TO (46,54),KRET	11900
255	120	XI=XM	11910
256		GO TO 119	11920
257	130	ISOLN=3	11930
258		GO TO 150	11940
259	132	ISOLN=4	11950
260	150	IF (FFLG.NF.0.) ISOLN=-ISOLN	11960
261		SOLN(1)=ROOT1	11970
262		SOLN(2)=ROOT2	11980
263		RETURN	11990
264		END	12000

120	-	216	255*																	
130	-	11	257*																	
132	-	185	259*																	
150	-	20	24	27	117	143	157	258	260*											
245	-	18	21*																	
381	-	92*	97																	
382	-	89	95*																	
384	-	88	98*																	
386	-	98	102*																	
391	-	107	110*																	
392	-	110	113*																	
395	-	65	116*																	
A	-	1AG	11	13	15															
AA	-	78=	79	81																
ABSLO	-	36=	37	40																
ABSUP	-	35=	40	41																
ABSX	-	1AG	243																	
ABSY	-	1AG	113	250	251															
ABSYC	-	56=	57	58																
ABSYMNI	-	37=	41=	57	58=															
B	-	1AG	11	12	16															
BR	-	80=	81																	
* DABS	-	35	36	56	88	107	110	113	210	248	250	251								
DLAST	-	179=	244	247=																
DLTA	-	28=	29	30	33=	50	62	63=	64	84=	121	200=	201	202=						
	-	204	206	242=	243	244	247	249												
* DLTAX	-	181=	182	183	208	210														
DMAX1	-		248																	
DX	-	217=	222	229	230															
DXMIN	-	29=	64																	
DX1	-	72=	76	77																
DX2	-	73=	75	77																
DX3	-	74=	75	76																
EFLG	-	7=	245=	260																
EPS	-	158=	159	163																
ERR	-	6=																		
FACTR	-	146=	150=	160=	165															
FHNDT	-	31=	208																	
FLAG	-	186=	188=	193=	199	203														
FLAST	-	48=	53	54=	86=	131	168													
FOFX	-	52=	53	54	56	60	83=	87	88	93	100	103	106=	107						
	-	109=	110	112=	113	115	120	133	171=											
FRACT	-	183=	187	192	210=	211														
FUNCT	-	1AG	3EX	17	21	52	67	71	83	123	156	166	197	215						
	-	253																		
FXLO	-	21=	22	32	36	39	48	137												
FXPLE	-	166=	167	168	171															
FXUP	-	17=	18	32	35	43	126	139												
I	-	5100																		
ISOLN	-	1AG	26=	116=	118=	135=	153=	257=	259=	260=										
J	-	34=	47=	5100																
JRET	-	147=	151=	161=	164=	169														
KRET	-	127=	140=	254																
L	-	180AG	184AG	185																
LOWER	-	5RL	12=	15=	21	23	28	38	49	65	136	158								

[illegible]

1	FUNCTION TABID(X,XA,YA,K,NN,IERR)	26790
2	IMPLICIT REAL*8 (A-H,O-Z)	
3	REAL*4 UUM	
C	TABID PERFORMS POLYNOMIAL INTERPOLATION ON A TABLE	26800
C	WITH ONE INDEPENDENT VARIABLE.	26810
4	COMMON /TABIC/ INCX,INCY,ISER,ID,KLO	27550
5	DIMENSION XA(1),YA(1),XX(6),YY(6)	27590
C	TEST FOR K OUT OF RANGE	27620
6	IF(K.GT.5 .OR. K.LT.1) GO TO 499	27630
7	N=NN	27640
8	DUMONE=1.0D0	
9	DUM=DSIGN(DUMONE,XA(INCX+1)-XA(1))	
10	ID = IFIX(DUM)	
11	IF(ISER) 100,100,90	27700
12	90 IF(X.EQ.XL) GO TO 311	27740
13	100 XL=X	27780
14	KP1=K+1	27790
15	IF(KP1-N)110,101,510	27800
16	101 KLO=IARS(MIN0(1,ID*N))-1	27830
17	GO TO 310	27840
18	110 IF(ID)130,110,120	27880
C	INITIALIZE FOR INCREASING X.	27890
C		27900
19	120 ILO=0	27910
20	IHI=N-1	27920
21	GO TO 200	27930
C	INITIALIZE FOR DECREASING X.	27940
C		27950
22	130 IHI=0	27960
23	ILO=N-1	27970
C	BINARY SEARCH - FIND MIDPOINT AND TEST FOR HIGH OR LOW	27980
C		27990
24	200 IC=(IHI+ILO)/2	28000
25	JC=1+IC*INCX	28010
26	IF(X-XA(JC))202,201,201	28020
C	LOW - SET APPROPRIATE INDEX	28030
27	201 ILO=IC	28040
28	GO TO 203	28050
C	HIGH - SET APPROPRIATE INDEX	28060
29	202 IHI=IC	28070
30	203 IF(IHI-ILO.NE.ID) GO TO 200	28110
31	300 INC=0	28140
32	IF((K/2)+(K/2)-K)302,301,300	28150
33	301 JLO=I+ILO*INCX	28180
34	JHI=1+IHI*INCX	28190
35	IF(DABS(X-XA(JLO)).GE.DABS(X-XA(JHI))) INC=1	
36	302 KLO=ILO-ID*(K-INC)/2	28240
37	IF(ID)304,302,303	28250
38	303 KLO=MAX0(0,MIN0(KLO,N-KP1))	28260
39	GO TO 310	28270
40	304 KLO=MAX0(K,MIN0(KLO,N-1))	28280
41	310 IF(ISER) 521,311,311	28310
42	311 JKY=1+KLO*INCX	28340
43	JKY=1+KLO*INCY	28350
44	JNCX=ID*INCX	28360

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45  JNCY=ID*INCY
46  DO 312 JDUM=1,KP1
47  IF(X.LT.1.00-36) GO TO 3111
48  IF(XA(JKX).LT.1.00-36) GO TO 3111
49  XX(JDUM)=X-XA(JKX)
50  GO TO 3112
51  3111 XX(JDUM)=0.0
52  3112 YY(JDUM)=YA(JKY)
53  JKX=JKX+JNCX
54  312  JKY=JKY+JNCY
55  CALL OVERFL(M)
56  DO 315 L=1,K
57  LP1=L+1
58  DO 315 LL=LP1,KP1
59  DENOM=(XX(LL)-XX(L))
60  YY(LL)=(YY(L)*XX(LL)-YY(LL)*XX(L))*ZERODP(DENOM)
61  315 CONTINUE
    C      CHECK FOR OVERFLOW - IF YES, GO TO ERROR COMMENT.
62  CALL OVERFL(M)
63  IF(M.NE.2) GO TO 500
    C
    C      INTERPOLATION IS COMPLETE AND SUCCESSFUL - RETURN.
64  TABID=YY(KP1)
65  IERR=1
66  RETURN
    C      WRITE ERROR COMMENTS.
    C
67  499 WRITE(6,3)
68  GO TO 511
69  500 WRITE(6,1)
70  IERR=2
71  GO TO 520
72  510 WRITE(6,2)
73  511 IERR=3
74  520 WRITE(6,4) X,K,NN,IERR
75  521 TABID=X
76  RETURN
    C      FORMATS
    C
77  1 FORMAT(50H DURING INTERPOLATION BY TABID, OVERFLOW OCCURED, )
78  2 FORMAT(30H TABID WAS CALLED WITH K.GE.N )
79  3 FORMAT(39H TABID WAS CALLED WITH K.GT.5 OR K.LT.1 )
80  4 FORMAT(5H X = F14.5,5XSH K = I3,5XSH N = I3,
    X41H TABID WILL SET RESULT TO X, SET IERR TO I3,I2H AND RETURN.)
81  END

```

```

28370
28380
28390
28410
28420
28450
28480
28490
28500
28510
28520
28540
28550
28570
28580
28590
28600
28610
28620
28650
28660
28670
28680
28690
28700
28710
28720
28730
28740
28750
28760
28790
28800
28810
28820
28830
28840
28850
28870

```


SYMBOL	-----	REFERENCES	-----
1	- 49WR 77*		
2	- 72WR 78*		
3	- 67WR 79*		
4	- 74WR 80*		
90	- 11 12*		
100	- 11 13*		
101	- 15 16*		
110	- 15 18*		
120	- 18 19*		
130	- 18 22*		
200	- 21 24*	30	
201	- 26 27*		
202	- 26 29*		
203	- 28 30*		
300	- 31* 32*		
301	- 32 33*		
302	- 32 36*	37	
303	- 37 38*		
304	- 37 40*		
310	- 17 39	41*	
311	- 12 41	42*	
312	- 4600 54*		
315	- 5600 5800	61*	
499	- 6 67*		
500	- 63 69*		
510	- 15 72*		
511	- 68 73*		
520	- 71 74*		
521	- 41 75*		
3111	- 47 48	51*	
3112	- 50 52*		
* DABS	- 35		
DENOM	- 59= 60		
* DSIGN	- 9		
DUM	- 3RL 9=	10	
DUMONE	- 8= 9		
* IARS	- 16		
IC	- 24= 25	27	29
ID	- 4CO 10=	16	18
IERR	- 1AG 65=	70=	73=
* IFIX	- 10		
IHI	- 20= 22=	24	29=
ILO	- 19= 23=	24	27=
INC	- 31= 35=	36	
INCX	- 4CO 9	25	33
INCY	- 4CO 43	45	34
ISER	- 4CO 11	41	
JC	- 25= 26		
JDUM	- 4600 49	51	52
JHI	- 34= 35		
JKX	- 42= 48	49	53=
JKY	- 43= 52	54=	
JLO	- 33= 35		

```

JNCX  "  .44= 53
JNCY  "  .45= 54
K      "  1AG 6 14 32 36 40 5600 74WR
KLO    "  .4C0 16= 36= 38= 40= 42 43
KPI    "  14= 15 38 4600 5800 64
L      "  5600 57 59 60
LL     "  5800 59 60
LPI    "  57= 5800
M      "  55AG 62AG 63
* MAXD "  .38 40
* MIND "  16 38 40
N      "  7= 15 16 20 23 38 40 74WR
NN     "  .1AG 7
* OVERFL "  55* 62*
* RETURN "  66* 76*
* TABIC "  4*
* TABID "  1* 64= 75=
X      "  1AG 12 13 26 35 47 49 74WR 75
XA     "  1AG 5DI 9 26 35 48 49
      "  THE VARIABLE- XL - IS USED BEFORE IT IS DEFINED
XL     "  12 13=
XX     "  5DI 49= 51= 52 60
YA     "  1AG 5DI 52
YY     "  5DI 52= 60= 64
ZERODP "  THE VARIABLE- ZERODP - IS USED BEFORE IT IS DEFINED
      "  60

```

I N D E X

FUNCTION ZEROOP (X)

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```
1  FUNCTION ZEROOP (X)
2  IMPLICIT REAL*8 (A-H,O-Z)
3  ZEROOP = 0.0
4  IF (X .NE. 0.0) ZEROOP = 1. / X
5  RETURN
6  END
```

SYMBOL	REFERENCES
* RETURN	5*
* X	1AG
* ZEROOP	1* 3= 4=

SYMBOL - ===== ROUTINES IN WHICH THE SYMBOL IS USED =====

A	- CONICL	DATLOC	DRDX	EQLBRM	GETAS	HCALC	INPUT	LKUP	MATRIX	MATS
AA	- OPUT	PRT2	PRT3	PRT4	PRT6	PRT7	RADIUS	ROOTS4	SEARCH	VARI
AAAN	- EFMT	EQLBRM	ROOTS4							
ABCYL	- PRT7									
AHDC	- MACHR									
AHDV	- DERIV									
AHS	- DISP	EFMT	EQLBRM	ROCKET	SAVE					
AUSA	- OPUT									
AUSA1	- OPUT									
AUSA2	- OPUT									
AUSA3	- OPUT									
ABSL0	- ROOTS4									
ABSL0T	- PRT7									
ABSUP	- ROOTS4									
ABSX	- ROOTS4									
ABSY	- ROOTS4									
ABSYC	- ROOTS4									
ABSYMN	- ROOTS4									
ABTOT	- PRT7									
AC	- SAVE									
ACSSAV	- BATES	CDSI	SISCAL							
ACSTRI	- BATES	CDSI	RECON	ROCKET	SISCAL					
AE	- PRT7									
A&AT	- RKTOUT	ROCKET								
A&ATL	- ROCKET									
A&F	- PRT7									
AFIT	- INTREC	RECON								
AFSRM	- BLDATA	FSCAL	PRT1							
AG	- HCALC									
AGV	- OUT1	RKTOUT								
AHALFC	- PRT7									
AHALFE	- BATES	BLDATA	CDSI	SISCAL						
AHALF1	- BLDATA	CDSI								
AHW	- PRT7									
AIT	- PRT7									
AITIN	- INERT	INIT1	PRT7							
AITVAC	- PRT7									
AITVIN	- INERT	PRT7								
AK	- BATES	BLDATA	CDSI	PRT1	SISCAL					
AKR	- DISP									
AKRST	- PRT7									
AKSLOT	- DISP									
AL	- BATES	BLDATA								
ALDE	- CDSI									
ALD2	- CDSI									
ALOG	- CDSI	EQLBRM	HCAIC	LEWIS	ROCKET	SAVE	SISCAL			
ALOG10	- EFMT									
ALPHA	- BATES	BLDATA	CDSI	DERIV	PRECAL	SISCAL				
AM	- HCALC	REACT								
AMBDA	- EQLBRM									
AMBDA1	- EQLBRM									
AMIRR	- BLDATA	INERT	PRT1							

I N D E X

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AMPN	-	PRT7			
AMPHR	-	BLDATA	INERT	PRT1	
AMW	-	PRT7			
AMI	-	HCALC			
AN	-	EOLBRM			
ANAME	-	REACT			
ANLQPS	-	PRT7			
ANN	-	HCALC			
ANT	-	OUT1			
ANUM	-	HCALC	OUT1	REACT	
AN2	-	PRT7			
AOD	-	GETAS	LKUP		
AP	-	MACHR	PRT7		
APEXT	-	ROCKET			
APP	-	RKTOUT	ROCKET		
APPL	-	ROCKET			
AR	-	AREAR			
ARATIO	-	ROCKET			
AREA	-	ROCKET			
AREAR	-	LKUP			
AREND	-	LKUP			
ARET	-	BLDATA	CDSI		
ARETB	-	BATES	BLDATA		
ARETE	-	BATES	BLDATA	CDSI	SISCAL
ARF	-	BATES	CONICL		
ARG1	-	DERIV			
ARG2	-	DERIV			
ARG3	-	DERIV			
ARG4	-	DERIV			
ARTIO	-	FOFRP	OPUT		
ASO	-	ROCKET			
AT	-	FAMCAL	PRT7		
ATAB	-	RKSF4	VARI		
ATABL	-	FOFRP	IDNOZL	PRECAL	
ATR	-	BLDATA	FSCAL	PRT1	
ATBAH	-	BLDATA	RECON		
ATEM	-	BLDATA			
ATOM	-	BLDATA	REACT		
AVEHI	-	FAMCAL			
AVG	-	ROCKET			
AW	-	RKTOUT	ROCKET		
AWT	-	ROCKET			
AW2	-	ROCKET			
A1	-	OPUT			
A2	-	OPUT			
A3	-	OPUT			
A3SIG	-	VARI			
B	-	CONICL	MATS	OPUT	ROOTS4 SEARCH
BATES	-	ERR			
BB	-	ROOTS4			
BIAS	-	RECON			
HIGB	-	SAVE			
BIGNO	-	GAUSS			
BLANK	-	LEWIS	REACT		
BLIP	-	MACHR			

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HLK	-	HCALC									
HLK001	-	BATES	CDSI	DATLOC	ERR	INIT1	INPUT	ITIDNZ	LFWIS	LEWIT	PRESET
	-	PRT1	REACT	ROCKET							
HLK002	-	BATES	CDSI	RECON	ROCKET	SISCAL					
HLK004	-	BATES	BLDATA	CDSI	FSCAL	INPUT	PRESET	PRT1	PRT2	PRT3	PRT4
	-	RECON	SISCAL								
HLK005	-	BATES	BLDATA	CDSI	DISP	ERR	FAMCAL	INFRT	INPUT	PRESET	PRT1
	-	PRT5	PRT7	RECON	SISCAL						
HLK006	-	BATES	FOFRP								
HLK007	-	BLDATA	CDSI	INPUT	PRT3	SISCAL					
HLK008	-	BLDATA	DISP	FSCAL	INPUT	PRESET	PRT1	PRT6			
HLK009	-	BLDATA	DISP	FSCAL	INERT	INIT1	INPUT	PRT1	PRT6	PRT7	RECON
HLK010	-	BLDATA	FSCAL	INERT	INPUT	PRT1					
HLK011	-	BLDATA	INPUT	SISCAL							
HLK012	-	ERR	OUTPUT								
HLK013	-	BATES	BLDATA	CDSI	FSCAL	PRT2	PRT3	PRT4	PRT6	SISCAL	
HLK014	-	FSCAL	PRT6								
HLK015	-	BLDATA	FAMCAL	INPUT	RECON						
HLK016	-	FAMCAL	INERT	INIT1	PRT6	PRT7	RECON				
HLK017	-	BLDATA	FAMCAL	INPUT	RECON						
HLK018	-	BLDATA	INPUT	PADJ							
HLK019	-	OUTPUT	PRT6								
HLK020	-	FAMCAL	RECON								
HLK021	-	BATES	BLDATA	CDSI	DISP	FAMCAL	INPUT	PRESET	PRT1	PRT2	PRT3
	-	PRT4	RECON	SISCAL							
HLK022	-	INTREC	RECON								
HLK023	-	BLDATA	FAMCAL	GETOAT	RECON						
HLK024	-	INTREC	RECON								
HLK025	-	BLDATA	ERR	INPUT	PRESET	PRT1	PRT7				
HLK026	-	BLDATA	INPUT								
HLK027	-	BLDATA	DISP	INPUT	PRT1						
HLK028	-	BATES	BLDATA	CDSI	INPUT	SISCAL					
RLOW	-	CTRL1	CTRL2	FOFRP							
ROB	-	BLDATA	DERIV	RKSF4							
ROT	-	LESSQ									
ROT2	-	LESSQ									
RO	-	EQLBRM	MATRIX	SAVE							
ROP	-	LEWIS	REACT	SAVE							
C	-	OPUT									
CALCH	-	HCALC	LEWIS	ROCKET	SAVE						
CASE	-	INPUT									
CAYR	-	FOFRP	OPUT								
CAY1	-	FOFRP	OPUT								
CAY2	-	FOFRP	OPUT								
CAY4	-	FOFRP	OPUT								
CDSI	-	ERR									
CDX4	-	CTRL2	RKSF4								
CF	-	PRT7									
CFOL	-	PRT7									
CFPROP	-	FAMCAL	PRT7								
CHECK	-	CTRL2	ROCKET								
CHEN	-	BLDATA	IDNOZL								
CINIT	-	FOFRP									
CK	-	BATES	BLDATA	CDSI	PRT1	RECON	SISCAL				
CLAME	-	BATES	BLDATA	CDSI	PRESET	PRT1	PRT2	PRT3	PRT4	SISCAL	

CLAME2	-	PRT3										
CLAM1	-	CDSI										
CNST1	-	CONST	FOFRP									
CNST10	-	FOFRP										
CNST2	-	DERIV	FOFRP									
CNST3	-	DERIV	FOFRP									
CNST4	-	DERIV	FOFRP									
CNST5	-	DERIV	FOFRP	OPUT								
CNST6	-	FOFRP	OPUT									
CNST7	-	FOFRP	OPUT									
CNST8	-	FOFRP	OPUT									
CNST9	-	DERIV	FOFRP									
CNTRL	-	RKSF4										
COEF	-	CPHS	SEARCH									
COEFX	-	GAUSS										
COMA	-	INERT	PRT7									
COMB	-	PRT7										
COMG	-	PRT7										
COMI	-	PRT7										
COMW	-	PRT7										
COM01	-	BATES	BLDATA	CONICL	CTRL1	DERIV	FOFRP	IDNOZL	ITIDNZ	LKUP	OPUT	
COM02	-	CONST	CTRL1	CTRL2	DERIV	FOFRP	FOFX	GETXX	IDNOZL	INIT	ITIDNZ	
		OPUT	PRECAL	REPLCE								
COM03	-	CONST	CTRL1	CTRL2	DERIV	FOFRP	FOFX	GETXX	IDNOZL	INIT	ITIDNZ	
		OPUT	PRECAL	REPLCE								
COM04	-	CONST	CTRL1	CTRL2	DERIV	FOFRP	IDNOZL	ITIDNZ	OPUT			
COM05	-	AREAR	CONST	CTRL1	CTRL2	DERIV	DRDX	FOFRP	FOFX	GETAS	GETXX	
		IDNOZL	INIT	LKUP	OPUT	RADIUS	REPLCE					
COM06	-	AREAR	DRDX	GETAS	IDNOZL	LKUP	RADIUS					
CONICL	-	DERIV	IDNOZL									
CONST	-	FOFRP										
CONSTS	-	PRT7										
CONT	-	FAMCAL	INPUT									
CONV6	-	EQLBRM	MATRIX									
CON2	-	RKSF4										
COS	-	BATES	CDSI	SISCAL								
CPC6	-	CONST										
CPCVEQ	-	EQLBRM	MATRIX									
CPCVFR	-	LEWIS										
CPG	-	CONST	DERIV	FOFRP	IDNOZL							
CPHS	-	EQLBRM	HCALC									
CPL	-	CONST	DERIV	FOFRP	IDNOZL	PRECAL						
CPMIX	-	IDNOZL										
CPP	-	CONST	FOFRP									
CPR	-	EQLBRM	OUT1	ROCKET								
CPRF	-	ROCKET										
CPRNT	-	BLDATA	FOFRP	IDNOZL	RKSF4							
CPR1	-	HCALC										
CPS	-	CONST	DERIV	FOFRP	IDNOZL	PRECAL						
CPSUM	-	CPHS	EQLBRM	HCALC	MATRIX	ROCKET						
CR	-	LEWIS										
CS	-	LESSQ										
CSHR	-	BLDATA	RECON									
CSCUEF	-	BATES	BLDATA	CDSI	DISP	PRT1	PRT2	PRT3	PRT4	RECON	SISCAL	
CSIND	-	RECON										

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CSTAR	-	RATES	BLDATA	CDS1	DISP	PRT2	PRT3	PRT4	PRT7	ROCKET	SISCAL
CSTAR1	-	RATES	BLDATA								
CSTAR2	-	PRT2	SISCAL								
CSTR	-	DISP	RKTOUT								
CTRL1	-	FOFRP									
CTRL2	-	FOFRP									
CUER	-	FOFRP	OPUT								
CUE0	-	FOFRP	OPUT								
CUE1	-	FOFRP	OPUT								
CUE2	-	FOFRP	OPUT								
CUE4	-	FOFRP	OPUT								
CUG0	-	BLDATA	FOFRP	IDNOZL							
D	-	LKUP									
DAB5	-	CONICL	CTRL1	CTRL2	DERIV	FOFRP	GETAS	MACHR	MATS	OPUT	RKSF4
	-	ROOTS4	TAB1D								
DAT	-	LEWIS									
DATA	-	FAMCAL	GETDAT	HCALC	LEWIS	REACT	RECON				
DATE	-	SEARCH									
DATLOC	-	ITIDNZ	LEWIS								
DO	-	ROCKET									
DE	-	DISP	PRT7								
DELCS	-	RECON									
DELF	-	DISP	PRT7								
DELG	-	EQLARM									
DELN	-	EQLARM	LEWIS								
DELT	-	FSCAL	INERT								
DELTAE	-	ROCKET									
DELTA	-	LIN									
DELTA	-	LIN									
DELTH	-	OPUT									
DELTIM	-	INERT									
DELTT	-	INERT									
DELTU	-	OPUT									
DELU	-	FOFRP									
DELU2	-	FOFRP									
DENOM	-	CTRL1	DERIV	TAB1D							
DENS	-	OUT1	REACT								
DERIV	-	FOFRP	RKSF4								
DETA	-	CTRL1									
DEXP	-	DERIV	FOFRP								
DFX	-	OPUT									
DH	-	ROCKET									
DIFFQ	-	CTRL1									
DISC	-	FOFRP									
DISLIM	-	BLDATA	DISP	PRT1							
DISP	-	ERR									
DIV	-	GETAS									
DLAST	-	ROOTS4									
DLNP	-	ROCKET									
DLNPE	-	ROCKET									
DLNT	-	EQLARM									
DLOG	-	FOFRP	OPUT								
DCT	-	ROCKET									
DLTA	-	ROOTS4									
DLTAX	-	ROOTS4									

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FI2..	=	INERY	INITI				
FI2	=	EFMT					
FI3	=	EFMT					
FL	=	BLDATA	OUT1				
FLAG	=	FOFRP	RKSF4	ROOTS4			
FLAST	=	ROOTS4					
FLDCL	=	FAMCAL					
FLJ	=	DRDX	LKUP				
FLOAT	=	VARI					
FM	=	BLDATA	OUT1				
FMT	=	BLDATA	EFMT	OUT1	RKTOUT	VARFMT	
FMT19	=	BLDATA	OUT1	RKTOUT			
FMT13	=	BLDATA	OUT1	RKTOUT			
FMT9X	=	BLDATA	EFMT	RKTOUT			
FMZEST	=	FAMCAL					
FN	=	BLDATA	LESSD	RKTOUT			
FOFRP	=	IDNOZL					
FOFX	=	GETXX	ROOTS4				
FOX	=	HGALC	OUT1	REACT			
FP	=	BLDATA	OUT1				
FPC	=	OUT1					
FPCI	=	LEWIS					
FRUI	=	OPUT					
FR	=	BLDATA	RKTOUT				
FRACT	=	ROOTS4					
FRHO	=	OUT1					
FRMT	=	EFMT					
FRI	=	BLDATA	RKTOUT				
FRI0	=	BLDATA	RKSF4				
FS	=	BLDATA	OUT1				
FSR	=	OUT1					
FSCAL	=	ERR					
FSRB	=	FAMCAL					
FSRM	=	FSCAL	PRT6				
FSSME	=	FAMCAL					
FT	=	BLDATA	OUT1				
FTDEL	=	PRT7					
FTVAC	=	PRT7					
FUEL	=	OUT1					
FUI	=	OPUT					
FUNCT	=	ROOTS4					
FV	=	BLDATA	OUT1				
FVAC	=	PRT7					
FVEHI	=	FAMCAL					
FX	=	OPUT					
FXLO	=	ROOTS4					
FXPLE	=	ROOTS4					
FXUP	=	ROOTS4					
FX1	=	OPUT					
FX2	=	OPUT					
FX3	=	OPUT					
FO	=	BLDATA	VARFMT				
F1	=	BLDATA	OUT1	RKTOUT	VARFMT		
F11X	=	EFMT					
F2	=	BLDATA	VARFMT				

F2X	-	EFMT							
F3	-	BLDATA	OUT1	RKTOUT	VARFMT				
F4	-	BLDATA	OUT1	VARFMT					
F5	-	BLDATA	OUT1	RKTOUT					
F63	-	EFMT							
F73	-	OUT1							
F74	-	EFMT							
F75	-	OUT1							
G	-	EQLBRM	FOFRP	GAUSS	MACHR	MATRIX	OPUT	PRECAL	
GAMA	-	MACHR	PRT7						
GAMB	-	MACHR							
GAMBAR	-	FOFRP							
GAMHB	-	MACHR							
GAMEX.	-	MACHR							
GAMM	-	MACHR							
GAMMA	-	CTRL1	FOFRP	IDNOZL					
GAMMAS	-	EQLBRM	OUT1	RKTOUT	ROCKET				
GAS	-	LEWIS	SEARCH						
GAUSS	-	EQLBRM							
GETAS	-	DRDX	LKUP	RADIUS					
GETXX	-	FOFRP							
GEX	-	MACHR							
GMACH	-	CTRL1	CTRL2	FOFRP	MACHR	OPUT			
GMNL	-	FOFRP	OPUT						
GMP	-	DERIV							
GMSSP	-	FOFRP	IDNOZL	PRECAL					
GMUG	-	DERIV	OPUT						
GMUS	-	DERIV	IDNOZL	PRECAL					
GNLST	-	CTRL1							
GNUM	-	CTRL1	DERIV						
GRT	-	DERIV							
H	-	CONST	CTRL1	DERIV	FOFRP	INIT	MATRIX	OPUT	
HCALC	-	SAVE							
HDELT	-	GETAS	LKUP						
HDA	-	GETXX	REPLCE						
HDNX	-	FOFRP	GETXX						
HU1	-	OUT1							
HDP	-	OUT1							
HEAD	-	OUT1							
HEADER	-	INPUT							
RLM	-	CONST	DERIV	FOFRP	IDNOZL	OPUT	PRECAL		
HM	-	CONST	FOFRP						
HP	-	EQLBRM	LEWIS	MATRIX	ROCKET				
HPP	-	HCALC	REACT	SAVE					
HSM	-	CONST	DERIV	FOFRP	IDNOZL	OPUT	PRECAL		
HSQ	-	GETAS							
HSTAG	-	CONST	DERIV						
HSUBO	-	HCALC	MATRIX	SAVE					
HSUM	-	EQLBRM	MATRIX	OUT1	RKTOUT	ROCKET			
HTBL	-	CTRL1	REPLCE						
HUP	-	GETXX	REPLCE						
HUPX	-	FOFRP	GETXX						
HO	-	CPHS	EQLBRM	FOFRP	HCALC	INIT	MATRIX	OUT1	REPLCE RKTOUT
HOD	-	FOFRP	INIT	REPLCE					
HOU	-	FOFRP	INIT	REPLCE					

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I	-	BATES	CDSI	CTRL2	DATLOC	DISP	PROX	EFMT	EQLBRM	FSCAL	GAUSS
	-	GETAS	GETDAT	HCALC	IDNOZL	INPUT	LESSQ	LEWIS	LEWIT	LIN	LKUP
	-	MATRIX	MATS	OUT1	PRT1	RADIUS	REACT	RECON	REPLCE	RKSF4	RKTOUT
	-	ROCKET	ROU154	SAVE	SEARCH	SISCAL	VARFMT	VARI			
IARS	-	EFMT	TAB1D								
IB	-	OUT1									
IHQDATA	-	DISP									
IRKP	-	RKSF4									
IBM	-	ERR	INPUT	RECON							
IC	-	SAVE	TAB1D								
ICNT	-	BATES	CDSI	RKSF4	SISCAL						
ICOMP	-	INTREC	RECON								
ICOUNT	-	BATES	CDSI	INTREC	SISCAL						
ICTR	-	MACHR									
ID	-	TAB1D									
IDBUG	-	BLDATA	CTRL1	FOFRP							
IDISP	-	DISP									
IDN	-	INPUT									
IDNOZ	-	ITIDN2									
IDNOZL	-	BATES									
IDNPRT	-	BLDATA	CONICL	DERIV	FOFRP	IDNOZL	LKUP	OPUT			
IE	-	EQLBRM	LEWIS								
IEERR	-	FOFRP	RKSF4	TAB1D							
IFIX	-	RECON	TAB1D								
IFLAG	-	RKSF4									
IFVD	-	RKSF4									
IHI	-	TAB1D									
II	-	MATS									
ILO	-	TAB1D									
ILOOP	-	RECON									
IMAT	-	EQLBRM	GAUSS	MATRIX							
IMP	-	EQLBRM									
IN	-	DATLOC	ITIDN7	LEWIS	REACT						
INC	-	EQLBRM	LEWIS	TAB1D							
INCX	-	BLDATA	TAB1D								
INCY	-	BLDATA	TAB1D								
INDEX	-	RKSF4									
INDX	-	CPHS	EQLBRM	GAUSS	HCALC	LEWIS	MATRIX	OUT1	REACT	RKTOUT	ROCKET
	-	SAVE	SEARCH								
INERT	-	FAMCAL	FSCAL								
INTT	-	FOFRP									
INIT1	-	ERR									
INPUT	-	ERR									
INPUTF	-	FAMCAL	INTREC								
INPUTG	-	PRT7									
INPUTI	-	PRT7									
INPUTM	-	INTREC									
INPUTN	-	INTREC									
INPUTU	-	PRT7									
INPUT1	-	INPUT									
INSERT	-	LEWIS									
INTR	-	RKSF4									
INTRY	-	CTRL1	CTRL2								
IUF	-	ROCKET									
IONS	-	EQLBRM	LEWIS								

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IP	-	ROCKET																		
IPASS	-	INTREC	RECON																	
IPC	-	BATES	CDSI	SISCAL																
IPP	-	ROCKET																		
IU	-	MATRIX																		
IUSAVE	-	SAVE																		
I01	-	EQLHRM	LFWIS	MATRIX	SAVE															
I02	-	EQLHRM	MATRIX																	
I03	-	MATRIX																		
IRKT01	-	PRESET	PRT1	ROCKET																
IRKT02	-	LEWIT	ROCKET																	
IS	-	HCALC																		
ISFR	-	BLDATA	FOFX	GETXX	TAB1D															
ISING	-	EQLHRM																		
ISOLN	-	GFTXX	LKUP	ROOTS4																
IST	-	LEWIS																		
ISTA1	-	FOFRP																		
ISUB	-	ROCKET																		
ISUP	-	ROCKET																		
ISV	-	ROCKET	SAVE																	
ISYM	-	MATRIX																		
IT	-	LEWIS	RKTOUT	ROCKET																
ITFR	-	EQLHRM																		
ITIDNZ	-	BATES																		
ITM	-	ROCKET																		
ITN	-	EQLHRM																		
ITNUM	-	ROCKET																		
ITNUMB	-	EQLHRM																		
ITROT	-	ROCKET																		
ITS1	-	EQLHRM																		
IUSE	-	CPHS	EQLHRM	HCALC	LEWIS	MATRIX	SAVE	SEARCH												
IUSE1	-	GAUSS																		
IX	-	SEARCH																		
IZ	-	LEWIS	OUT1																	
IZERO	-	HCALC	REACT																	
I2F	-	SEARCH																		
I35	-	EQLHRM																		
J	-	CPHS	CTRL2	DRDX	EFMT	EQLHRM	GAUSS	GETAS	GETDAT	HCAIC	LEWIS									
	-	LIN	LKUP	MATRIX	MATS	OUT1	RADIUS	REACT	RKSF4	RKTOUT	ROOTS4									
	-	SAVE	SEARCH																	
JC	-	TAB1D																		
JDELG	-	EQLHRM																		
JDUM	-	TAB1D																		
JHI	-	TAB1D																		
JJ	-	EQLHRM	LIN	MATS	OUT1	REACT														
JKG	-	EQLHRM																		
JKX	-	TAB1D																		
JKY	-	TAB1D																		
JLIQ	-	EQLHRM	SAVE																	
JLIQS	-	SAVE																		
JLQ	-	TAB1D																		
JNCX	-	TAB1D																		
JNCY	-	TAB1D																		
JRET	-	ROOTS4																		
JSOL	-	EQLHRM	ROCKET	SAVE																

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NF	--	DISP	ERR	INERT	INPUT	PRESET	PRT1												
NFUEL	--	REACT																	
NFZ	--	RKTOUT	ROCKET																
NI	--	PRT7																	
NIHFLG	--	BLDATA	INPUT																
NIRM	--	INPUT																	
NIHQUT	--	DISP	INPUT																
NIDN	--	INPUT																	
NJ	--	REACT																	
NL	--	INPUT																	
NLEWIS	--	BATES	CDSI	INPUT	PRESET	PRT1	RECON	SISCAL											
NLM	--	EQLBRM	HCALC	LEWIS	MATRIX	REACT	SAVE	SEARCH											
NLM1	--	LEWIS																	
NLS	--	REACT																	
NLSW	--	FOFRP	OPUT																
NL600	--	OUTPUT	PRT6																
NMLT	--	LEWIS																	
NMP	--	FSCAL	PRESET	PRT1															
NN	--	GAUSS	OUT1	RKSF4	TABID														
NOF	--	LEWIS	ROCKET																
NOMIT	--	LEWIS	REACT	SEARCH															
NQUT	--	INPUT																	
NOZPOS	--	BLDATA	FAMCAL																
NO7TYP	--	BLDATA	DERIV	IDNOZL	LKUP														
NP	--	BLDATA	FSCAL	INERT	LEWIS	PRT1	ROCKET												
NPASS	--	FOFRP																	
NPH	--	FAMCAL																	
NPHRC	--	IDNOZL																	
NPLOT	--	BLDATA	ERR	PRESET	PRT1	PRT7													
NPMAX	--	FSCAL																	
NPP	--	ROCKET																	
NPPR	--	IDNOZL																	
NPRINT	--	ERR	OUTPUT																
NPT	--	CPHS	EFMT	EQLBRM	HCALC	MATRIX	OUT1	RKTOUT	ROCKET	SAVE	VARFMT								
NPTS	--	GETAS	IDNOZL	LKUP	RECON	VARI													
NREAC	--	HCALC	LEWIS	OUT1	REACT														
NRECON	--	ERR	FAMCAL	PRESET	PRT1	PRT7													
NS	--	CPHS	EQLBRM	HCALC	LEWIS	MATRIX	OUT1	RKTOUT	SAVE	SEARCH									
NSERT	--	LEWIS																	
NSI	--	ERR	INPUT	PRESET	PRT1														
NSS	--	HCALC																	
NSUB	--	ROCKET																	
NSUP	--	ROCKET																	
NT	--	LEWIS	ROCKET																
NTAPE	--	BLDATA	ERR	PRESET	PRT1	PRT7													
NTB	--	FSCAL	PRESET	PRT1															
NTRY	--	CTRL1	CTRL2	FOFRP	RKSF4														
NUM	--	HCALC																	
NUMB	--	EQLBRM																	
NUNIT	--	BLDATA	GETDAT	RECON															
NUP	--	FOFX	GETXX	REPLCE															
NV	--	OUT1	RKTOUT																
NWRDS	--	BLDATA	GETDAT	RECON															
NWRIBM	--	INPUT																	
NI	--	RKSF4																	

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SPOND1	-	PRT7					
SQRM	-	CTRL1	CTRL2	DERIV	OPUT		
SQRT	-	ROCKET	VARI				
SRMDTI	-	PRT7					
SRMS1	-	PRT6					
SRMVTI	-	PRT7					
SRTAB	-	RKSF4					
SS	-	EQLBRM	MATRIX				
SSS	-	MATRIX					
SSUM	-	EQLBRM	HCALC	OUT1	ROCKET		
STATIC	-	BLDATA	FAMCAL				
STDYST	-	INTREC					
STFLAG	-	INTREC					
STOP	-	CTRL1	CTRL2	ERR	GETDAT	INPUT	LIN
SUR	-	LEWIS	OUT1	RKTOUT	SEARCH		
SURAR	-	LEWIS	ROCKET				
SUM	-	EQLBRM	GAUSS	SAVE			
SUMN	-	EQLBRM	LEWIS	MATRIX			
SUMX	-	LESSQ	VARI				
SUMXY	-	LESSQ					
SUMX2	-	LESSQ					
SUMX2Y	-	LESSQ					
SUMX3	-	LESSQ					
SUMX4	-	LESSQ					
SUMY	-	LESSQ					
SUM1	-	EQLBRM					
SUM2	-	EQLBRM					
SUPAR	-	BATFS	CDS1	RECON	ROCKET	SISCAL	
SV	-	LEWIS	MATRIX				
SWDOTN	-	FAMCAL	PRT7				
S0	-	EQLBRM	GETAS	LEWIS	MATRIX	ROCKET	
S1	-	GETAS					
S2	-	GETAS					
S3	-	GETAS					
S4	-	GETAS					
S5	-	GETAS					
S6	-	GETAS					
S7	-	GETAS					
T	-	FOFRP	LEWIS	OPUT	RKTOUT	ROCKET	
TABIC	-	BLDATA	FOFX	GETXX	TABID		
TABID	-	FOFX	GETXX				
TAN	-	BATES					
TAU	-	DERIV	FOFRP				
TAUG	-	DERIV					
TAUZ	-	PRT7					
TA	-	FSCAL	PRT1				
TRNOM	-	FSCAL					
TCEST	-	ROCKET					
TDIFF	-	FOFRP					
TDY	-	CTRL2					
TEM	-	RKTOUT	SAVE				
TEMP	-	EQLBRM	GAUSS	HCALC	LEWIS	RKSF4	SEARCH
TEMPI	-	RKSF4					
TEREC	-	BLDATA	RECON				
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TERM2	-	DERIV																		
TEST	-	DERIV	MACHR																	
TEXTK	-	BLDATA	IDNOZL																	
TG	-	DFRIV	FOFRP	OPUT																
TGOTP	-	FOFRP	OPUT																	
TGRAIN	-	PRT7																		
TGSAV	-	DERIV																		
TGO	-	DERIV	FOFRP																	
THI	-	ROCKET																		
THIGH	-	EQLBRM	HCALC	SEARCH																
TI	-	OPUT																		
TIME	-	GETDAT	INERT	PADJ	PRT7	RECON														
TIMEZ	-	INERT	RECON																	
TITLE	-	INPUT																		
TIN	-	CPHS	EQLBRM	HCALC																
TLOW	-	EQLBRM	HCALC	SEARCH																
TM	-	CONST	DERIV	FQLBRM	FOFRP	HCALC	IDNOZL	MATRIX	OPUT	PRECAL										
TMACH	-	CTRL1	MACHR																	
TMFLT	-	EQLBRM	ROCKET																	
TMID	-	CPHS	SEARCH																	
TN	-	EQLBRM																		
TGO	-	CTRL2																		
TOOBIG	-	SEARCH																		
TOP	-	LESSQ																		
TOP2	-	LESSQ																		
TOTN	-	EQLBRM	OUT1	RKTOUT																
TP	-	DERIV	EQLBRM	FOFRP	LEWIS	MATRIX	OPUT	ROCKET												
TPN	-	FSCAL	PRT6																	
TRA	-	OUT1	RKTOUT																	
TRACE	-	EQLBRM	LEWIS	OUT1	RKTOUT															
TSAVE	-	HCALC																		
TSOL	-	BLDATA																		
TSREC	-	BLDATA	RECON																	
TST	-	INTREC																		
TSTAG	-	CONST	DERIV	FOFRP	IDNOZL	OPUT														
TSTAGK	-	BLDATA	IDNOZL																	
TSUM	-	EQLBRM																		
TT	-	CPHS	EQLBRM	FOFRP	HCALC	MATRIX	OPUT	ROCKET	SAVE											
TTT	-	EQLBRM	OUT1	RKTOUT	ROCKET															
TV	-	LEWIS	MATRIX																	
TWEH	-	BLDATA	RECON																	
TWOBLT	-	ROOTS4																		
TWOPCI	-	ROOTS4																		
T1	-	ROOTS4	SEARCH																	
T2	-	ROOTS4	SEARCH																	
T3	-	ROOTS4																		
U	-	FOFRP	OPUT																	
UDIFF	-	FOFRP																		
UG	-	CTRL1	CTRL2	DERIV	FOFRP	OPUT														
UGDN	-	FOFX	GETXX	REPLCE																
UGDNX	-	FOFRP	GETXX																	
UGFIX1	-	DERIV																		
UGFIX2	-	DERIV																		
UGSAV	-	DERIV																		

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UGSQ	-	DERIV					
UGTHL	-	CTRL1	REPLCF				
UGUP	-	FOFX	GETXX	REPLCF			
UGUPX	-	FOFRP	GETXX				
UGO	-	DERIV	FOFRP	INIT	REPLCE		
UGODN	-	FOFRP	INIT	REPLCE			
UGOUP	-	FOFRP	INIT	REPLCE			
UGOU	-	DERIV	FOFRP				
UI	-	OPUT					
UINCH	-	FOFRP					
UISAV	-	OPUT					
UP	-	CTRL1	DERIV	FOFRP	OPUT		
UPDN	-	GETXX	REPLCE				
UPDNX	-	FOFRP	GETXX				
UPDUG	-	FOFRP	OPUT				
UPPER	-	ROOTS4					
UPTRL	-	CTRL1	REPLCE				
UPUP	-	GETXX	REPLCF				
UPUPX	-	FOFRP	GETXX				
UPN	-	FOFRP	INIT	REPLCE			
UPOUN	-	FOFRP	INIT	REPLCE			
UPOUP	-	FOFRP	INIT	REPLCE			
USQ	-	OPUT	ROCKET				
UT	-	FOFRP	OPUT				
UTPR	-	FOFRP	OPUT				
UV	-	LEWIS	MATRIX				
UZERO	-	FOFRP					
V	-	EFMT	LEWIS	OUT1	REACT	RKTOUT	VARFMT
VAC1	-	FOFRP	OPUT	RKTOUT			
VACINL	-	FOFRP	OPUT				
VARFMT	-	OUT1	RKTOUT				
VF	-	PRT7					
VFCYL	-	PRT7					
VFH	-	PRT7					
VFN	-	PRT7					
VL	-	LEWIS					
VLM	-	EQLBRM	OUT1				
VMIN	-	LEWIS	REACT	SAVE			
VMOC	-	RKTOUT					
VOL	-	EQLBRM	HCALC	LEWIS	MATRIX		
VP	-	PRT7					
VPH	-	PRT7					
VPLS	-	LEWIS	REACT	SAVE			
VPN	-	PRT7					
V1	-	LEWIS	SAVE				
V2	-	LEWIS	SAVE				
W	-	EFMT	GETAS	RKSF4			
WOF	-	CDS1					
WOOT	-	PRT7					
WD1	-	PRT2	PRT3	SISCAL			
WU2	-	BLDATA	CDS1	PRT3			
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WFI	-	PRT7					

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YI	-	ROOTS4							
YLO	-	ROOTS4							
YM	-	ROOTS4							
YMN	-	ROOTS4							
YN	-	OUT1							
YTABLE	-	LIN							
YUP	-	ROOTS4							
YX	-	OUT1							
YY	-	TAB10							
Z	-	AREAR	DERIV	DRDX	GAUSS	GETAS	OUT1	RADIUS	RKTOUT
ZERU	-	REACT							
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Z2	-	RKSF4							

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BLODATA	5
BLODATA	233
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LEWIS	123
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MACHR	309
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PRT4	87
PRT5	91
PRT6	93
PRT7	97
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3.0 PROGRAM LISTING, PART TWO

This part of the SRB-II program listing contains an INDEX listing of the Internal Ballistics Module (IBM), the Nozzle Submergence and Contour Effects Module (NSCE), and all of their associated subprograms.

The INDEX listing begins on the following page. The SUPER INDEX begins on page 3-519 and the Table of Contents begins on page 3-549.

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FUNCTION ACOS (Z)

PAGE 1

1	FUNCTION ACOS (Z)	490
2	COMMON/CONSTS/GNOT,PI,PI02,RADIAN	
3	ACOS = PI	
4	IF (Z .LE. -1.0) RETURN	510
5	ACOS = 0.0	520
6	IF (Z .GE. 1.0) RETURN	530
7	ACOS = PI/2.	
8	IF (Z .EQ. 0.0) RETURN	550
9	X = ABS(Z)	560
10	ACOS = SORT(1. - X) * ((((((1.0012625 * X + .0066701) * X	570
	C -.0170881) * X + .0308919) * X - .0501743) * X	580
	C + .088979) * X - .2145938) * X + 1.5707963)	590
11	IF (Z .LT. 0.0) ACOS = PI-ACOS	
12	RETURN	610
13	END	620

I N D E X

FUNCTION ACOS (Z)

SYMBOL		REFERENCES						
*	ABS	-	9					
*	ACOS	-	1*	3=	5=	7=	10=	11=
*	CONSTS	-	2*					
	GNOT	-	2C0					
	PI	-	2C0	3	7	11		
	PI02	-	2C0					
	RADIAN	-	2C0					
*	RETURN	-	4*	6*	8*	12*		
*	SORT	-	10					
	X	-	9=	10				
	Z	-	1AG	4	6	8	9	11

I N D E X

SUBROUTINE AEPSUB

PAGE 4

SYMBOL	REFERENCES
10	7
20	7
AEE	400
AEEA	600
AEEB	600
AEPSUB	1*
AESUB	8*
AFF	300
AJPP	300
AL	300
ALAMDA	200
ALAMIN	200
ALL	300
ALX	200
ASE	300
ASEA	500
ASEB	500
ASI	300
AWE	200
AWEA	600
AWEB	600
COMP	2*
COMT	3*
COMW	4*
DELH	600
DELL	200
DV	400
DVA	600
DVB	600
HE	300
HEA	600
HEB	600
HEIA	600
HEIB	600
HSUBMG	500
NEND	500
NSUBMG	500
PARMAB	5*
PARMAC	6*
PEP01	400
RA	300
RAMIN	200
RAO	300
RC	300
RETURN	16*
RT	200
SUMDV	300
SUMDVA	500
SUMDVB	500
TAU	300
WI	300
WT	300
XBARIH	300

I N D E X

SUBROUTINE AEPSUB

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xR - 3C0

12457- 6

59010
59150
59170
59180
59200

59220
59230
59240
59250
59260
59270
59280
59300
59310
59320
59330
59340
59350
59360
59370
59380
59390
59400
59410
59420
59430
59440
59450
59460
59470
59480
59490
59500
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49      AEEA=ALR*HEA*ANO**2.
50      AEEB=(ALR*HEB*AFF*AR-AR*ATT)*ANO**2.
51      GO TO 96
52      94 AEEA=(ALR*HEA*AFF*AR-AR*ATT)*ANO**2.
53      AEEB=0.0
54      96 OVA=(AFF*AR-AR*ATT)*HEA*ANO**2.
55      IVB=(AFF*AR-AR*ATT)*HEB*ANO**2.
56      GO TO 110
57      100 AEE=0.
58      UV=0.
59      IF (NEND.EQ.1.OR.VSUBMG.EQ.0)GO TO 110
60      AEA=0.0
61      AEB=0.0
62      OVA=0.0
63      UVB=0.0
64      110 IF (RC-RA0)280,280,120
65      120 IF (RAX-RE1)280,280,130
66      130 IF (RA0-RE1)140,140,150
67      140 RAMIN=RE1
68      GO TO 160
69      150 RAMIN=RA0
70      160 IF (RAX-RC)170,170,180
71      170 RAMAX=RAX
72      GO TO 190
73      180 RAMAX=RC
74      190 IF (RAMIN-RAMAX)200,280,200
75      200 RA=RAMAX
76      CALL XRSUB(KXRSUB)
77      CALL ARSSUB(XR,XRO,RA,RAD,ALRS)
78      CALL ALRSUB(RT,ALRS,GAMAT,ALR)
79      ALRMAX=ALR
80      RA=RAMIN
81      CALL XRSUB(KXRSUB)
82      CALL ARSSUB(XR,XRO,RA,RAD,ALRS)
83      CALL ALRSUB(RT,ALRS,GAMAT,ALR)
84      ALRI=ALR
85      CALL HESUB
86      HEI=HE
87      IF (NEND.EQ.1.OR.VSUBMG.EQ.0)GO TO 210
88      HEIA=HEA
89      HEIB=HEB
90      210 ALL=DELL+ALRI
91      IF (ALL-ALRMAX)230,230,220
92      220 ALL=ALRMAX
93      230 CALL RASUB(KRASUB)
94      RAMAX=RA
95      CALL HESUB
96      ALAMIN=ACOS(SORT(TAU**2-(RAMIN-RE1)**2)/TAU)
97      ALAMDA=ACOS(SORT(TAU**2-(RA-RE1)**2)/TAU)
98      TEMP1=ALAMDA-ALAMIN
99      IF (TEMP1-.1)240,240,250
100      240 TEMP1=.1
101      250 TEMP2=SIN(TEMP1/2.)
102      RA=(SIN((ALAMDA+ALAMIN)/2.)/TEMP1)*TEMP2*TAU**2+RE1
103      CALL XRSUB(KXRSUB)

```

59540
59590
59400

59610
59620
59630
59640
59650
59660
59670
59680
59690
59700
59710
59720
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59740
59750
59760
59770
59780
59790
59800
59810
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59830

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59850
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60100
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60200
60210
60220
60230
60240
60250
60260
60270
60280
60290

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SUBROUTINE AESUB

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156	360	ALRI=ALL	60310
157		HEI=HE	60320
158		RAMIN=RAMAX	60330
159		IF (NEND.EQ.1.OR.VSUMMG.EQ.0) GO TO 330	
160		HEIA=HEA	
161		HEIB=HEB	
162		GO TO 330	60340
163	370	RETURN	60350
164		END	60360

SYMBOL	-----	REFERENCES	-----
10	" 19	20*	
20	" 20	21*	
30	" 20	23*	
40	" 22	25*	
50	" 28	29*	
60	" 28	31*	
70	" 32	33*	
80	" 32	35*	
90	" 30	34	36*
94	" 48	52*	
96	" 51	54*	
100	" 19	57*	
110	" 47	56	59 64*
120	" 64	63*	
130	" 65	66*	
140	" 66	67*	
150	" 66	69*	
160	" 68	70*	
170	" 70	71*	
180	" 70	73*	
190	" 72	74*	
200	" 74	75*	
210	" 87	90*	120 123
220	" 91	92*	
230	" 91	93*	
240	" 99	100*	
250	" 99	101*	
260	" 105*		
264	" 108	112*	
266	" 111	114*	
268	" 107	116*	
270	" 116	117*	
280	" 64	65	74 116 124*
290	" 124	125*	
300	" 125	126*	
310	" 125	128*	
320	" 127	129*	
330	" 136	139*	159 162
340	" 140	141*	
350	" 140	142*	
358	" 150	155*	
360	" 155	156*	
370	" 124	155	163*
" ABS	" 31		
	THE VARIABLE- ACOS -IS USED BEFORE IT IS DEFINED		
ACOS	" 40	42	96 97 104 147
AEE	" 7C0	45=	57= 105= 148=
AEAA	" 10C0	49=	52= 60= 109= 112= 151=
AEEB	" 10C0	50=	53= 61= 110= 113= 152=
" AESUB	" 1*		
AFF	" 6C0	39=	45 46 50 52 54 55
AINC	" 2C0		
AJBB	" 8C0		

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[illegible]

D256-1m920-4

I N D E X

SUBROUTINE AESUB

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GAMARO	-	42=	43											
GAMAT	-	4C0	27AG	78AG	83AG	132AG								
HE	-	6C0	45	46	48	86	105	106	108	118	135	148	149	157
HEA	-	10C0	49	52	54	98	109	112	114	121	137	151	153	160
HEB	-	10C0	50	55	89	110	115	122	138	152	154	161		
HEI	-	8C0	86=	105	106	118=	135=	144	149	157=				
HEIA	-	10C0	88=	109	112	114	121=	137=	151	153	160=			
HEIB	-	10C0	89=	110	115	122=	138=	152	154	161=				
HEO	-	3C0												
HER	-	3C0												
HESUB	-	44*	85*	95*	134*	144*								
HE1	-	3C0												
HE2	-	3C0												
HSUBMG	-	9C0	48	108										
KRASUB	-	8C0	12AG	17AG	93AG	142AG								
KXRSUB	-	8C0	14AG	25AG	76AG	81AG	103AG	130AG	146AG					
NEND	-	9C0	47	59	87	107	120	136	150	159				
VSUBMG	-	9C0	47	59	87	107	120	136	150	159				
PARMAB	-	9*												
PARMAC	-	10*												
PARMD	-	8*												
PEPUI	-	7C0												
RA	-	6C0	13	18	24=	26AG	38	40	41	75=	77AG	80=	82AG	94
	-	97	102=	104	105	106	110	112	114	115	120=	131AG	143	145=
	-	147	149	153	154									
RAMAX	-	21=	23=	71=	73=	74	75	94=	106	114	115	119	143=	145
	-	149	153	154	158									
RAMIN	-	5C0	67=	69=	74	80	96	106	114	115	119=	126=	128=	129
	-	145	149	153	154	158=								
RAO	-	6C0	13=	19	26AG	37	42	43	64	66	69	77AG	82AG	125
	-	128	131AG											
RASUB	-	12*	17*	93*	142*									
RAX	-	18=	20	21	65	70	71	124						
RC	-	6C0	64	70	73	124	125	126						
RETURN	-	163*												
RE1	-	3C0	19	20	23	24	65	66	67	96	97	102		
RE2	-	3C0												
RFDM	-	2C0												
RT	-	5C0	27AG	28	31	32	78AG	83AG	132AG					
R2DM	-	2C0												
R3DM	-	2C0												
R4DM	-	2C0												
R5DM	-	2C0												
R6DM	-	2C0												
R7DM	-	2C0												
R8DM	-	2C0												
SIN	-	101	102											
SQRT	-	31	37	38	96	97	104	147						
SUMDV	-	6C0												
SUMOVA	-	9C0												
SUMDVH	-	9C0												
TAU	-	6C0	96	97	102	105	110	112						
TAUEO	-	3C0												
TAUE1	-	3C0												
TAUWDM	-	2C0												

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SUBROUTINE AESUB

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TEMP1	-	36=	39	98=	99	100=	101	102					
TEMP2	-	37=	39	42	43	101=	102						
TEMP3	-	38=	39	40	41								
VCE	-	3C0											
VFE0	-	3C0											
WI	-	6C0											
* WORKA	-	2*											
* WORKRE	-	3*											
WT	-	6C0											
XBARI	-	8C0											
XBARIH	-	6C0											
XR	-	6C0	15	26AG	36	38	41	77AG	82AG	104	131AG	147	
XRO	-	4C0	15=	25AG	36	37	43	77AG	82AG	131AG			
* XRSUB	-	14*	25*	76*	81*	103*	130*	146*					

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0256-10020-4

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47 130 AL(3)=0. 95140
48 140 IF(TV2-TAU)150,150,160 95150
49 150 IF(TV4-TAU)180,180,170. 95160
50 160 AL(4)=ALV8+DELL3 95170
51 AFP=AFP+(TV2-2.0*TAU+TV4)*ALV8*AFD 95180
52 GO TO 190 95190
53 170 AL(4)=(TV4-TAU)*ALV8/(TV4-TV2) 95200
54 AFP=AFP+(TV4-TAU)*AL(4) 95210
55 GO TO 190 95220
56 180 AL(4)=0. 95230
57 190 IF(TV4-TAU)200,210,210 95240
58 200 IF(TV5-TAU)230,230,220 95250
59 210 AL(5)=(RV4+TAU)*(AV3-AV2) 95260
60 AFP=AFP+(RV4+TV5)*(RV4+TV4)*SIN(AV3-AV2)-AL(5)*(RV4+TAU) 95270
61 GO TO 240 95280
62 220 AL(5)=(RV4+TAU)*(AV3-ACOS(((RV4+TV4)/(RV4+TAU))*COS(AV2)))) 95290
63 AFP=AFP+(RV4+TV5)*(RV4+TAU)*SIN(AL(5)/(RV4+TAU))-(RV4+TAU)*AL(5) 95300
64 GO TO 240 95310
65 230 AL(5)=0. 95320
66 240 IF(TV5-TAU)250,260,260 95330
67 250 IF(TV6-TAU)280,280,270 95340
68 260 AL(6)=ALVC 95350
69 AFP=AFP+(TV5-2.0*TAU+TV6)*ALVC 95360
70 GO TO 290 95370
71 270 AL(6)=ALVC*(TV6-TAU)/(TV6-TV5) 95380
72 AFP=AFP+(TV6-TAU)*AL(6) 95390
73 GO TO 290 95400
74 280 AL(6)=0. 95410
75 290 IF(TV6-TAU)300,310,310 95420
76 300 IF(TV7-TAU)410,410,320 95430
77 310 BV1=BV1M 95440
78 AFP=AFP+(RV5+TV7)*(RV5+TV6)*SIN(BV1)-BV1*(RV5+TAU)**2 95450
79 AFP=AMAX1(AFP,0.0) 95460
80 GO TO 330 95470
81 320 BV1=BV1M+AV3-ACOS(XV7/(TAU+RV5)) 95480
82 AFP=AFP+(RV5+TV7)*(RV5+TAU)*SIN(BV1)-BV1*(RV5+TAU)**2 95490
83 AFP=AMAX1(AFP,0.0) 95500
84 330 IF(RSLVRV)370,370,340 95510
85 340 BVX=ASIN(RV7*SIN(THV)/(RV5+TV7))-ASIN(RV7*SIN(THV-THSLVV)/(RV5+RSL 95520
XV7V)) + THSLVV 95530
86 IF(BVX)350,350,360 95540
87 350 CONTINUE 95550
88 BVX=0.0 95560
89 360 TEMP=SQRT(TAUW**2.+(RV5+TV7)**2.-2.*TAUW*(RV5+TV7)*COS(ASIN(RV7* 95570
X SIN(THV)/(RV5+TV7)))) 95580
90 TEMPA=ASIN(RV7*SIN(THV)/(RV5+TV7)) 95590
91 TEMPB=3.14159-ASIN(RV7*SIN(THV)*ZERODV(TEMP)) 95600
92 TEMPAP=ASIN(SIN(TEMPB)*TEMP/(RSLVRV+RV5)) 95610
93 BVXX=TEMPAP-TEMPA 95620
94 ASLVR=THV*RF**2.-(RF-TAUW)*RV7*SIN(THV)-(THV-THSLVV)*RF**2. 95630
X+(RSLVRV+RV5)*RV7*SIN(3.14159-THV+THSLVV-ASIN(RV7*SIN(THV-THSLVV)/ 95640
X(RSLVRV+RV5)))-TEMP*(RSLVRV+RV5)*SIN(3.14159-TEMPAP-TEMPB) 95650
X-(RSLVRV+RV5)**2.*(BVXX+BVX) 95660
95 370 IF(TAUW-TAU)390,380,380 95670
96 380 HV2=BV2M 95680

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  97      AFP=AFH+THV*RF**2-RF*RV7*SIN(THV)-RV2*(RV5+TAU)**2      95690
  98      AFP=AMAX1(AFP,0.0)      95700
  99      GO TO 400      95710
100      390      BV2=ACOS(((TAU+RV5)**2+(RF-TAUW+RV5)**2-RF**2)/(2.*(TAU+RV5)*      95720
      X(RF-TAUW+RV5))-BV1M-AV3-PI02+THV      95730
101      AFP=AFH+THV*RF**2-RV7*RF*SIN(THV)+RV7*(TAU+RV5)*SIN(BV2M-BV2)      95740
      X-RF**2*ACOS(SQRT(1.-(RV5+TAU)*SIN(BV2M-BV2)/RF)**2))-BV2*(TAU+R      95750
      AV5)**2.      95760
102      400      AL(7)=(BV1+BV2)*(RV5+TAU)      95770
103      GO TO 420      95780
104      410      AL(7)=0.      95790
105      BV1=0.      95800
106      420      IF(ASLVR)430,430,440      95810
107      430      CONTINUE      95820
108      ASLVR=0.0      95830
109      440      IF(AFP)450,450,460      95840
110      450      CONTINUE      95850
111      AFP=0.0      95860
112      460      CONTINUE      95870
113      470      IF(TH0)790,790,480      95880
114      480      IF(RF-RV1-TAU)750,750,490      95890
115      490      IF(RV2-TAU)510,500,500.      95900
116      500      PERIM = (RV1+TAU)*TH0      95910
117      AREA = TH0 *(RF**2.-(RV1+TAU)**2.)      95920
118      GO TO 790      95930
119      510      ANGAJB = ASIN((RF-RV5-TAJW)*SIN(THV)/(TV6+RV5))      95940
120      ANGARC = PI-THV-ANGAJB      95950
121      ANGACB = ASIN((RF-RV5-TAJW)*SIN(ANGAJB)/RF)      95960
122      ANGBAC = PI-ANGAJB-ANGACB      95970
123      BC = RF*SIN(ANGBAC)/SIN(ANGABC)      95980
124      TV6PR = BC+RV5      95990
125      TV7PR = ((RF-TAUW+RV5)**2.-RV1**2.+RV5**2.-2.*(RF-RV5-      96000
      XTAUW)*RV5*COS(ANGABC))/(2.*RV1-2.*RV5+2.*(RF-RV5-TAUW)      96010
      X*COS(ANGABC))      96020
126      TEMP76 = AMIN1(TV7PR,TV6PR)      96030
127      IF(TEMP76-TAU)660,660,520      96040
128      520      CONTINUE      96050
129      IF(TV6-TAU)560,530,530      96060
130      530      CONTINUE      96070
131      FR = (TAU+RV2)/SIN(AV1)      96080
132      AR = RV1+RV2+FR      96090
133      ANGRQA = PI-ASIN(AR*SIN(AV1)/(RV1+TAU))      96100
134      ANGQAR = PI-ANGRQA-AV1      96110
135      QR = (RV1+TAU)*SIN(ANGQAR)/SIN(AV1)      96120
136      ANGQAG = ASIN(QR*SIN(AV1)/(RV1+TAU))      96130
137      IF(ANGQAG-TH0 )550,540,540      96140
138      540      CONTINUE      96150
139      QR = AR*SIN(TH0 )/(SIN(PI-AV1-TH0 ))      96160
140      PERIM = QR      96170
141      AREA = TH0 *RF**2.-QR*AR*SIN(AV1)      96180
142      GO TO 790      96190
143      550      PQ = (RV1+TAU)*(TH0-ANGQAG)      96200
144      PERIM = PQ+QR      96210
145      ARFA = TH0 *RF**2.-(TH0-ANGQAG)*(RV1+TAU)**2.-QR*      96220
      XAR*SIN(AV1)      96230

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146      GO TO 790
147      560 AR = SQRT((RV5+TAU)**2.+(RF-RV5-TAUW)**2.-2.*(RV5+TAU)*
      X(RF-RV5-TAUW)*COS(ANGABC))
148      ANGRAB = ASIN((TAU+RV5)*SIN(ANGABC)/AR)
149      ANGRAG = ANGRAB-THV
150      ANGARB = PI-ANGABC-ANGRAB
151      ANGARQ = PI02-ANGARB
152      ANGAQR = PI-ASIN(AR*SIN(ANGARQ)/(RV1+TAU))
153      ANGQAR = PI-ANGAQR-ANGARQ
154      ANGQAG = ANGQAR + ANGRAG
155      ANGASB = ASIN((RF-RV5-TAJW)*SIN(THV)/(RV5+TAU))
156      ANGSHA = PI-THV-ANGASB
157      IF (TV7-TAU) 630,570,570
158      570 AREA = TH0 *RF**2.+(RF-RV5-TAUW)*(RV5+TAU)*SIN(ANGSHA)
159      IF (ANGRAG-TH0) 590,580,580
160      580 ANGBRA = ASIN((RF-RV5-TAUW)*SIN(THV+TH0)/(RV5+TAU))
161      ANGRBA = PI-ANGBRA-THV-TH0
162      ANGRBS = ANGSHA-ANGRBA
163      RS = (RV5+TAU)*ANGRBS
164      PERIM = RS
165      AREA = AREA-(RF-RV5-TAUW)*(RV5+TAU)*SIN(ANGRBA)
      X-ANGRBS*(RV5+TAU)**2.
166      GO TO 790
167      590 ANGRQA = PI-ASIN(AR*SIN(PI02-ANGARB)/(TAU+RV1))
168      ANGRAQ = PI02+ANGARB-ANGRQA
169      ANGQAG = ANGRAQ+ANGRAG
170      ANGRBS = ANGSHA-ANGAQ
171      RS = (RV5+TAU)*ANGRBS
172      AREA = AREA-ANGRBS*(RV5+TAU)**2.-(RF-RV5-TAUW)*
      X(RV5+TAU)*SIN(ANGARC)
173      600 IF (ANGQAG-TH0) 620,610,610
174      610 CONTINUE
175      ANGQAR = TH0 -ANGRAG
176      ANGAQR = PI02+ANGARB-ANGQAR
177      QR = AR*SIN(ANGQAR)/SIN(ANGAQR)
178      PERIM = QR+RS
179      AREA = AREA-QR*AR*SIN(PI02-ANGARB)
180      GO TO 790
181      620 ANGPAG = TH0 -ANGQAG
182      PQ = (RV1+TAU)*ANGPAG
183      QR = (RV1+TAU)*SIN(ANGRAQ)/SIN(PI02-ANGARB)
184      PERIM = PQ+QR+RS
185      AREA = AREA-QR*AR*SIN(PI02-ANGARB)-ANGPAG*(RV1+TAU)**2.
186      GO TO 790
187      630 ANGSAW = ACOS((RF**2.+(RF-RV5-TAUW)**2.-(RV5+TAU)**2.)/(2.*RF*(RF-
      XRV5-TAUW)))
188      ANGSAW = ANGSAW-THV
189      IF (ANGSAW-TH0) 650,640,640
190      640 CONTINUE
191      PERIM = 0.0
192      AREA = 0.0
193      GO TO 790
194      650 ANGASB = ASIN((RF-RV5-TAUW)*SIN(THV+ANGSAW)/(RV5+TAU))
195      ANGSHA = PI-THV-ANGASB-ANGASH
196      AREA = (TH0 -ANGSAW)*RF**2.+(RF-RV5-TAUW)*

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      XSIN(THV+ANGSAG)
197      ANGRQA = PI-ASIN(AR*SIN(PI02-ANGARB)/(TAU+RV1))
198      ANGRAQ = PI02+ANGARB-ANGRQA
199      ANGRAQ = ANGRAQ+ANGRAQ
200      ANGRHS = ANG5BA-ANGABC
201      RS = (RV5+TAU)*ANGRHS
202      IF(ANGHAG-TH0) 600,580,580
203      CONTINUE
204      670 IF(TV5PR-TV7PR) 740,680,690
205      680 PERIM = 0.0
206      AREA = 0.0
207      GO TO 790
208      690 IF(TAU-TAUW) 692,692,698
209      692 ANGOAB=ACOS(((RV1+TAU)**2.+(RF-RV5-TAUW)**2.-(RV5+TAU)**2.)/
      X(2.*(RV1+TAU)*(RF-RV5-TAUW)))
210      ANGAQB=ASIN((RF-RV5-TAUW)*SIN(ANGQAB)/(RV5+TAU))
211      ANGAQB=PI-ANGAQB-ANGQA3
212      ANGASB=ASIN((RF-RV5-TAUW)*SIN(THV)/(RV5+TAU))
213      ANGABS=PI-THV-ANGASB
214      ANGOAG=ANGQAB-THV
215      IF(ANGQAG-TH0) 696,694,694
216      694 ANGAQB=ASIN((RF-RV5-TAUW)*SIN(THV+TH0)/(RV5+TAU))
217      ANGAQB=PI-THV-TH0-ANGAQB
218      ANGA3S=ANGABS-ANGABU
219      PERIM=ANGQBS*(RV5+TAU)
220      GO TO 790
221      696 PERIM=(RV5+TAU)*(ANGABS-ANGAQB)+(RV1+TAU)*(TH0-ANGQAG)
222      GO TO 790
223      698 ANGSAB=ACOS(((RF**2.+(RF-RV5-TAUW)**2.-(RV5+TAU)**2.)/(2.*RF*
      X(RF-RV5-TAUW)))
224      ANGSAG = ANGSAB - THV
225      IF(ANGSAG-TH0) 710,700,700
226      700 CONTINUE
227      PERIM = 0.0
228      AREA = 0.0
229      GO TO 790
230      710 ANGOAB = ACOS(((RV1+TAU)**2.+(RF-RV5-TAUW)**2.-(RV5+TAU)**2.)/(2.*
      X(RV1+TAU)*(RF-RV5-TAUW)))
231      ANGOAG = ANGOAB - THV
232      ANGABS = ACOS(((RF-RV5-TAUW)**2.+(RV5+TAU)**2.-RF**2.)/(2.*(RF-RV5
      X-TAUW)*(RV5+TAU)))
233      IF(ANGQAG - TH0) 730,720,720
234      720 CONTINUE
235      ANGAQB = ASIN(((RF-RV5-TAUW)*SIN(THV+TH0))/(RV5+TAU))
236      ANGAQB = PI - THV - TH0 - ANGAQB
237      ANGOBS = ANGABS - ANGA3D
238      QS = (RV5 + TAU)* ANGOBS
239      PERIM = QS
240      AREA = (THV+TH0 -ANGSAB)*RF**2.+RF*(RF-RV5-TAUW)*SIN(ANGSAB)-(RV5
      X+TAU)**2.*ANGQBS - (RF-RV5-TAUW)*(RV5+TAU)*SIN(ANGABQ)
241      GO TO 790
242      730 ANGA3Q = ACOS(((RF-RV5-TAUW)**2.+(RV5+TAU)**2.-(RV1+TAU)**2.)/(2.*
      X(RF-RV5-TAUW)*(RV5+TAU)))
243      ANGOBS = ANGABS - ANGA3Q
244      QS = (RV5+TAU)*ANGQBS

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245     ANGPAQ = THV + TH0 - ANGQAB          97340
246     PQ = ANGPAQ * (RV1 + TAU)           97350
247     PERIM = PQ + QS                     97360
248     AREA = (THV+TH0 - ANGQAB)*RF**2.*RF*(RF-RV5-TAUW)*SIN(ANGQAB)-
X(RV5+TAU)**2.* ANGQBS-(RV1+TAU)*(RF-RV5-TAUW)*SIN(ANGQAB)-(THV+
XTH0 -ANGQAB)*(RV1+TAU)**2.             97370
249     GO TO 790                          97380
250     740  AT = SQRT((RF-RV5-TAUW)**2.+(RV5+TAU)**2.-2.*(RF-RV5-TAUW)*(RV5+TA
XU)*COS(ANGABC))                         97390
251     ANGATB = ASIN((RF-RV5-TAUW)*SIN(ANGABC)/AT) 97400
252     ANGSTA = PI/2-ANGATB                97410
253     ANGAST = PI-ASIN(AT*SIN(ANGSTA)/RF)    97420
254     ANGTAB = PI-ANGABC -ANGATB          97430
255     ANGSA = PI-ANGAST -ANGSTA           97440
256     ANGQAG = ANGSA+ANGTAB-THV           97450
257     IF(ANGQAG - TH0 ) 760,750,750       97460
258     750  CONTINUE                       97470
259     PERIM = 0.0                          97480
260     AREA = 0.0                           97490
261     GO TO 790                          97500
262     760  ANGQSA = PI-ANGAST              97510
263     ANGQAS = PI-ASIN(RF*SIN(ANGQSA)/(RV1+TAU)) 97520
264     ANGQAS = PI - ANGQAS - ANGQSA       97530
265     ANGQAG = ANGQAS + ANGQAS            97540
266     IF(ANGQAG-TH0) 780,770,770          97550
267     770  CONTINUE                       97560
268     ANGQAS = TH0 -ANGQAG                97570
269     ANGQAS = PI-ANGQAS -ANGQSA          97580
270     QS = RF*SIN(ANGQAS)/SIN(ANGQAS)     97590
271     AREA = RF**2.*ANGQAS-RF*QS*SIN(ANGQSA) 97600
272     PERIM = QS                           97610
273     GO TO 790                          97620
274     780  ANGPAQ = TH0 - ANGQAG           97630
275     PQ = (RV1+TAU)*ANGPAQ               97640
276     QS = RF*SIN(ANGQAS)/SIN(ANGQAS)     97650
277     PERIM = PQ + QS                     97660
278     AREA = (ANGPAQ+ANGQAS)*RF**2.-QS*RF*SIN(ANGQSA)-ANGPAQ*(RV1+TAU)*
X**2.                                     97670
279     790  CONTINUE                       97680
280     AFP=AFP+AREA                        97690
281     ALP=ALP+PERIM                       97700
282     RETURN                              97710
283     END                                  97720

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I N D E X

SUBROUTINE AFPSUB

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540	-	137	138*											
550	-	137	143*											
560	-	129	147*											
570	-	157	158*											
580	-	159	160*	202										
590	-	159	167*											
600	-	173*	202											
610	-	173	174*											
620	-	173	181*											
630	-	157	187*											
640	-	189	190*											
650	-	189	194*											
660	-	127	203*											
670	-	204*												
680	-	204	205*											
690	-	204	208*											
692	-	208	209*											
694	-	215	216*											
696	-	215	221*											
698	-	208	223*											
700	-	225	226*											
710	-	225	230*											
720	-	233	234*											
730	-	233	242*											
740	-	204	250*											
750	-	114	257	25d*										
760	-	257	262*											
770	-	266	267*											
780	-	266	274*											
790	-	113	118	142	146	166	180	186	193	207	220	222	229	241
	-	249	261	27J	279*									
THE VARIABLE - ACOS - IS USED BEFORE IT IS DEFINED														
ACOS	-	62	81	100	101	187	209	223	230	232	242			
AFD	-	4C0	28*	31*	34	37	42*	51						
AFF	-	7C0												
AFP	-	10C0	13*	22*	34*	37*	45*	51*	54*	60*	63*	69*	72*	78*
	-	79*	82*	83*	97*	98*	101*	109	111*	280*				
AFPSUB	-	1*												
AHO	-	5C0												
AINC	-	3C0												
AJPP	-	7C0	19*											
AL	-	7C0	21*	22	24*	33*	36*	37	39*	44*	45	47*	50*	53*
	-	54	56*	59*	60	62*	63	65*	66*	71*	72	74*	102*	104*
ALADM	-	3C0												
ALBDM	-	3C0												
ALBDM	-	3C0												
ALL	-	7C0												
ALP	-	12C0	14*	281*										
ALPX	-	6C0												
ALPY	-	6C0												
ALS1DM	-	3C0												
ALS2DM	-	3C0												
ALVA	-	8C0	33	34	36									
ALVB	-	8C0	50	51	53									
ALVC	-	8C0	68	69	71									

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D256-10020-4

I N D E X

SUBROUTINE AFPSUB

PAGE 22

AL7	-	1000												
AL8	-	1000												
AMAX1	-	79	83	98										
AMIN1	-	126												
ANGABC	-	120=	121	122	123	125	147	148	150	170	172	200	250	251
		254												
ANGABQ	-	211=	217=	218	221	236=	237	240	242=	243				
ANGABS	-	213=	218	221	232=	237	241							
ANGACB	-	121=	122											
ANGAJH	-	119=	120											
ANGAQR	-	210=	211	216=	217	235=	236							
ANGAQR	-	152=	153	176=	177									
ANGAQS	-	263=	264	269=	270	276								
ANGARB	-	150=	151	167	168	176	179	183	185	197	198			
ANGARQ	-	151=	152	153										
ANGASB	-	155=	156	194=	195	212=	213							
ANGAST	-	253=	255	262										
ANGATB	-	251=	252	254										
ANGBAC	-	122=	123											
ANGBBA	-	160=	161											
ANGPAQ	-	181=	182	185	245=	246	274=	275	278					
ANGQAH	-	209=	210	211	214	230=	231	245	248					
ANGWAG	-	136=	137	143	145	154=	169=	173	181	199=	214=	215	221	231=
		233	265=	266	274									
ANGQAR	-	134=	135	153=	154	175=	176	177						
ANGWAS	-	264=	265	268=	269	270	271	276	278					
ANGWBS	-	218=	219	237=	238	240	243=	244	248					
ANGQSA	-	262=	263	264	269	271	278							
ANGKAB	-	148=	149	150										
ANGKAG	-	149=	144	159	169	175	199	202						
ANGKAG	-	168=	169	183	198=	199								
ANGKBA	-	161=	162	165										
ANGKBS	-	162=	163	165	170=	171	172	200=	201					
ANGKQA	-	133=	134	167=	168	197=	198							
ANGSAR	-	187=	188	223=	224	240	248							
ANGSAG	-	188=	189	194	195	196	224=	225	256=	257	265	268		
ANGSAT	-	255=	256											
ANGSBA	-	156=	158	162	170	195=	200							
ANGSTA	-	252=	253	255										
ANGTAB	-	254=	256											
ANODM	-	300												
APX	-	600												
APY	-	600												
AR	-	132=	133	139	141	145	147=	148	152	167	177	179	185	197
AREA	-	16=	117=	141=	145=	158=	165=	172=	179=	185=	192=	196=	206=	228=
		240=	248=	260=	271=	278=	280							
ASE	-	700												
ASI	-	700												
ASIN	-	THE VARIABLE- ASIN	-IS USED BEFORE IT IS DEFINED											
		85	89	90	91	92	94	119	121	133	136	148	152	155
		160	167	194	197	210	212	216	235	251	253	263		
ASLVR	-	600	94=	106	108=									
AT	-	250=	251	253										
AV1	-	800	21	27	30	44	131	133	134	135	136	139	141	145
AV2	-	800	27	30	44	59	60	62						

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SUBROUTINE AFPSUB

PAGE 23

AV3	-	9C0	59	60	62	81	100							
AW	-	3C0												
BC	-	123=	124											
BVX	-	10C0	17=	85=	86	88=	94							
BVXX	-	10C0	18=	93=	94									
BV1	-	9C0	77=	78	81=	82	102	105=						
BV1M	-	9C0	77	81	100									
BV2	-	9C0	96=	97	100=	101	102							
BV2M	-	9C0	96	101										
B71	-	11C0												
B91	-	11C0												
* COML	-	5*												
* COM0	-	6*												
* COMT	-	7*												
* COMY	-	8*												
* COMZ	-	9*												
* CONSTS	-	2*												
* COS	-	62	89	125	147	250								
DELL3	-	8C0	27=	28	30=	31	33	36	37	41=	50			
DEL3	-	11C0	40=											
DEL7	-	11C0												
* DUMYB	-	4*												
FR	-	131=	132											
GN0T	-	2C0												
HE	-	7C0												
KGAM	-	12C0												
KRASBB	-	12C0												
KXRSBB	-	12C0												
* PARMA	-	10*												
* PARMC	-	11*												
* PARMO	-	12*												
PERIM	-	15=	116=	140=	144=	164=	178=	184=	191=	205=	219=	221=	227=	239=
	-	247=	259=	272=	277=	281								
PI	-	2C0	120	122	133	134	139	150	152	153	156	161	167	195
	-	197	211	213	217	236	253	254	255	262	263	264	269	
PI02	-	2C0	21	100	151	167	168	176	179	183	185	197	198	252
PQ	-	143=	144	182=	184	246=	247	275=	277					
QR	-	135=	136	139=	140	141	144	145	177=	178	179	183=	184	185
QS	-	238=	239	244=	247	270=	271	272	276=	277	278			
RA	-	7C0												
RADIAN	-	2C0												
RAU	-	7C0												
RdH1	-	6C0												
RC	-	7C0												
* RETURN	-	282*												
RF	-	3C0	94	97	100	101	114	117	119	121	123	125	141	145
	-	147	155	158	160	165	172	187	194	196	209	210	212	216
	-	223	230	232	235	240	242	248	250	251	253	263	270	271
	-	276	278											
RFH1	-	6C0												
RS	-	163=	164	171=	178	184	201=							
RSLVRV	-	9C0	84	85	92	94								
RV1	-	8C0	114	116	117	125	132	133	135	136	143	145	152	167
	-	182	183	185	197	209	221	230	242	246	248	249	275	278
RV2	-	8C0	20	21	22	32	34	35	115	131	132			

I N D E X

SUBROUTINE AFPSUH

PAGE 24

RV3	-	8C0	25	27	28	43	44	45						
RV4	-	8C0	59	60	62	63								
RVS	-	9C0	78	81	82	85	89	90	92	94	97	100	101	102
		119	121	124	125	147	148	155	158	160	163	165	171	172
		187	194	196	201	209	210	212	216	219	221	223	230	232
		235	238	240	242	244	248	250	251					
RV7	-	9C0	85	89	90	91	94	97	101					
R2DM	-	3C0												
R3DM	-	3C0												
R4DM	-	3C0												
R5DM	-	3C0												
R6DM	-	3C0												
R7DM	-	3C0												
R8DM	-	3C0												
SIN	-	60	63	76	82	85	89	90	91	92	94	97	101	119
		121	123	131	133	135	136	139	141	145	148	152	155	158
		160	165	167	172	177	179	183	185	194	196	197	210	212
		216	235	240	248	251	253	263	270	271	276	278		
SURT	-	89	101	147	250									
SUMDV	-	7C0												
TAN	-	27	30											
TAU	-	7C0	20	21	22	25	26	28	30	31	32	34	35	37
		43	44	45	48	49	51	53	54	57	58	59	60	62
		63	66	67	69	71	72	75	76	78	81	82	85	87
		100	101	102	114	115	116	117	127	129	131	133	135	136
		143	145	147	148	152	155	157	158	160	163	165	167	171
		172	182	183	185	187	194	197	201	208	209	210	212	216
		219	221	223	230	232	235	238	240	242	244	246	248	250
		263	275	278										
TAUTOV	-	10C0												
TAUw	-	3C0	89	94	95	100	119	121	125	147	155	158	160	165
		172	187	194	196	208	209	210	212	216	223	230	232	235
		240	242	248	250	251								
TEMP	-	89=	91	92	94									
TEMPA	-	90=	93											
TEMPAP	-	92=	93	94										
TEMPB	-	91=	92	94										
TEMP76	-	126=	127											
THSLV	-	6C0												
THSLVV	-	6C0	85	94										
THV	-	9C0	85	89	90	91	94	97	100	101	119	120	149	155
		156	160	161	188	194	195	196	212	213	214	216	217	224
		231	235	236	240	245	248	256						
TH0	-	5C0	113	116	117	137	139	141	143	145	158	159	160	161
		173	175	181	189	196	202	215	216	217	221	225	233	235
		236	240	245	248	257	266	268	274					
THSLVDM	-	6C0												
TV2	-	8C0	26	27	28	30	31	34	36	37	48	51	53	
TV4	-	8C0	49	51	53	54	57	60	62					
TV5	-	8C0	58	60	63	66	69	71						
TV6	-	8C0	67	69	71	72	75	78	119	129				
TV6PR	-	124=	126	204										
TV7	-	8C0	76	78	82	85	89	90	157					
TV7PR	-	125=	126	204										
VSLVR	-	5C0												

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      W1      ~      7CO
      WORKA   ~      3*
      WT      ~      7CO
      XBARIH  ~      7CO
      XR      ~      7CO
      XV7     ~      8CO      81
      ZERODV  ~      THE VARIABLE= ZERODV -IS USED BEFORE IT IS DEFINED
      ~      91

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I N D E X

SUBROUTINE AIHST(IE)

- PAGE 27

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41      CALL XLIN(TIMEPS,EPCA,NEPS,TIME,EPSA,27)
42      CALL XLIN(TIMEPS,EPCN,NEPS,TIME,EPSN,28)
43      EPS=EPSA+(EPSV-EPSA)*AINCH*ZERODV(HCO)
44      120 IF (NACCEL)140,140,130
45      130 CONTINUE
46      CALL XLIN(TIMEAC,ACCELT,NACCEL,TIME,ACCEL,29)
47      140 DAPHI=DAP
48      DAP=6.28318*EPS*RF**2
49      PRNT(III,8)=DAP
50      IE=0
51      WDOTI=WDOTD
52      PIN=PD(III-1)
53      PCRII=PIN*(1.+GAMA*AMACH**2.)/(GAMA+1.)
54      IF(III.LE.2)AMACH=U*ZERODV(SQRT(GNOT*H**GAMA))
55      IF(III-NI)150,150,160
56      150 CONTINUE
57      V(III)=(APHI+AP+DAPHI+DAP)*DELZ/2.
58      GO TO 170
59      160 V(III)=VCN-VFN
60      170 CONTINUE
61      IF(TIME-DELIST)180,180,190
62      180 CONTINUE
63      PDPR(1)=0.5*PHI
64      PDPR(III)=0.5*PHI
65      VPR(III)=V(III)
66      190 CONTINUE
67      IF(PIN.GT.(0.5*PHI).OR.TIME.GT.0.0)GO TO 210
68      200 CONTINUE
69      WDOTD=0.0
70      PD(III)=0.5*PHI
71      RETURN
72      210 CONTINUE
73      IF(KDUMP(3))230,230,220
74      220 CONTINUE
75      WRITE(6,600)PIN,PD(III),PDPR(III-1),PDPR(III),V(III),VPR(III),
A      XPHI,AP,U,UTMP,WDOTI,DWDOT,WDOTD,R,T,DELT,III,POY,TEMP,ACCEL
76      230 CONTINUE
77      TS=T
78      AMSQ=AMACH**2.
79      DT=T*(GAMA-1.)*(1.+GAMA*AMSQ)*AMSQ*WDOT*ZERODV((1.-AMSQ)*WDOT)
80      DP=PIN*WDOT*2.*GAMA*AMSQ*(1.+(GAMA-1.)*AMSQ/2.)*ZERODV(WDOT*(1.-
      IAMSQ))
81      POUT=PIN-DP
82      ITER=0
83      240 IF(ITER-1)250,260,270
84      250 T=TS-DT
85      GO TO 270
86      260 T=TS-DT
87      270 TX2=TX1
88      TX1=T
89      DP=PIN-POUT
90      IFLAG=0
91      280 IF(IFLAG-1)290,300,310
92      290 CONTINUE
93      PD(III)=PIN-DP

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102800

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102930

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102990

103010

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103110

103120

103130

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94      GO TO 310
95      PD(III)=PIN*0.2
96      PD2=PD*1
97      PD1=PD(III)
98      WDT=(PD(III)+PIN)*(2.*V(III)-VPR(III))-V(III)*(PDPR(III)+
XPDPR(III-1))*ZEROUV(12.*TS+1)*DELTA)
99      PRNT(III,11)=WDT
100     WDOT=WDT+D*WDT-D*WDT
101     IF(WDOT) 320,320,330
102     320 CONTINUE
103     WDOT=0.0
104     UTMP=0.0
105     GO TO 332
106     330 UTMP=WDOT*H*T/(PD(III)*(AP+DAP))
107     332 UMAX=SQRT(GNOT*GAMA*H*T)
108     IF(UTMP .GT. UMAX)UTMP=UMAX
109     WDOT=WDOT+
110     PDY=(WDOT+0.5*H*DOT)-(WDOT)*UTMP*ZEROUV(GNOT)+H*TS*(APHI+DAPHI
X) + (PIN+PD(III))/2
111     X=(AP+DAP-APHI-DAPHI)-(V(III)*(U+UTMP)*(PIN+PD(III))-PDPR(III)-
XPDPR(III-1))+(PD(III)+PIN)*(U+UTMP)*(V(III)-VPR(III))*ZEROUV(24.*
XGDOT*H
112     X=(TS+1)*DELTA)*ZEROUV(AP+DAP)
113     TEMP=((PIN+PD(III))*(AP+DAP+APHI+DAPHI)*ALCEL*H/2)*ZEROUV(24.*H*
XIS + 1)*(AP + DAP))
114     PDY=PDY-POY
115     PDY2=PDY+TEMP
116     PDY1=PDY
117     E2=E1
118     F1=(PD1-POY1)*ZEROUV(PDX1)
119     IF(KDUMP(4))350,350,360
120     340 CONTINUE
121     WRITE(6,580)IFLAG,PD(III),POY,WDOT,PDX2,PDY2,1+E2
122     350 IF(ARSL1)-CXP 340,440,360
123     360 CONTINUE
124     IFLAG=IFLAG+1
125     IF(IFLAG.LT.2)GO TO 380
126     370 IF(IFLAG-2)380,380,480
127     380 CONTINUE
128     IF((UTMP/UMAX) .LT. 0.75)GO TO 390
129     SLOPE=(PDY2-POY1)/(PDX2-PDX1)
130     IF(ABS(SLOPE) .GT. 0.95)GO TO 390
131     PD(III)=(PDY1-SLOPE*PDX1)/(1.0-SLOPE)
132     GO TO 310
133     390 IF(IFLAG .GT. 5)PD(III)=PDY-(PD(III)-POY)
134     IF(IFLAG .GT. 5)GO TO 310
135     PD(III)=PDY-(PD(III)-PDY)*H*T/GNOT*(WDOT)/(PDY*(AP+DAP))*2
136     GO TO 310
137     410 IF(NAKRST)440,440,420
138     420 CONTINUE
139     IF(TIME.GT.TIMEFH(NPH) .OR. NREQN.EQ.0) GO TO 440
140     430 CONTINUE
141     IE=1
142     AKRST=.9*AKRST

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103290
103300
103310
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I N D E X

SUBROUTINE AIRST(IE)

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```

142      GO TO 470
143      440      IE=1
144              PMIN=PH
145              IF (PMAX-5000.0) 460,450,450
146      450      CONTINUE
147              PH=1.1*PH
148              GO TO 470
149      460      PH=(PMAX+PH)/2.
150      470      CLOPS=0.0
151              DEED=0.0
152              WD=0.0
153              GO TO 630
154      480      IF (UTMP .GE. UMAX) GO TO 410
155              WRITE(6,590) IFLAG
156              WRITE(6,580) IFLAG,PD(III),PDY,WDOTD,PDX2,PDY2,E1,E2
157              IE=2
158              ICHN=5
159              RETURN
160      490      CONTINUE
161              T=10-(GAMA-1.)*JTMP**2/(2.*GNOT*GAMA*R)
162              DT=15-T
163              POUT=PD(III)
164              TY2=TY1
165              TY1=T
166              TE2=TE1
167              IE1=(TX1-TY1)*ZERODV(TX1)
168              ITER=ITER+1
169              IF (ITER-2) 260,500,500
170      500      IF (ITER-27) 520,520,510
171      510      WRITE(6,610) III
172              WRITE(6,620) ITER,TX1,TY1,TX2,TY2,TE1,TE2
173              IE=2
174              ICHN=5
175              RETURN
176      520      IF (KDUMP(3)) 540,540,530
177      530      WRITE(6,620) ITER,TX1,TY1,TX2,TY2,TE1,TE2
178      540      IF (ABS(TE1)-CR7) 560,560,550
179      550      CONTINUE
180              GO TO 240
181      560      P=PD(III)
182              IF (UTMP .GE. UMAX) GO TO 410
183              U=UTMP
184              AMACH=U*ZERODV(SQRT(GNOT*GAMA*R*T))
185              DELTA=WDOTD*ZERODV(12.*(AP+DAP)*U)
186              AMPN=AMAX1(AMPN,AMACH)
187      580      FORMAT(2X,6HIFLAG=12,2X,3HPD=1PE10.3,2X,4HPDY=1PE10.3,2X,6HWDOTD=1
XPE10.3,2X,5HPDX2=1PE10.3,2X,5HPDY2=1PE10.3,2X,3HE1=1PE10.3,2X,3HE2
X=1PE10.3//)
188      590      FORMAT(1X,7HICOUNT=13,1X,107HITERATION FOR INCREMENT DISCHARGE PRE
XSSURE IN SUBROUTINE AIRST HAS FAILED **EXECUTION HAS BEEN TERMINAT
XED**)
189      600      FORMAT(/5H PIN=1PE10.3,2X,8HPD(III)=1PE10.3,2X,12HPDPR(III-1)=1PE
X10.3,2X,10HPDPR(III)=1PE10.3,2X,7HV(III)=1PE10.3,2X,9HVPR(III)=1PE
X10.3,2X,6HAPHI=1PE10.3,2X,3HAP=1PE10.3,2X,2HNU=1PE10.3,2X,5HUTMP=1PE1
X0.3,2X,6HWDOTI=1PE10.3,2X,6HWDOTD=1PE10.3,2X,6HWDOTD=1PE10.3/3H R=

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103800
103810
103820
103830
103840
103850
103860
103870
103880
103890
103900
103910

103930
103940
103950
103960

103990
104000
104010
104020
104030
104040
104050
104060
104070
104080
104090
104100
104110
104120
104130
104140

104160
104170

104180
104200
104210
104230
104240
104250
104260
104270
104280
104290
104300
104310
104320

		X1PE10.3,2X,2HT=1PE10.3,2X,SHDEL=1PE10.3,2X,4HTI=13,2X,4HPDY=1PE1	104330
		X0.3,2X,5HTEMP=1PE10.3,2X,6HACCEL=1PE10.3//)	104340
190	610	FORMAT(25HITERATION FOR INCREMENT,13,53HDISCHARGE TEMPERATURE IV	104350
		ASUBROUTINE AIBST HAS FAILED.)	104360
191	620	FORMAT(1X,5HITER=13,2X,2HT=1PE10.3,2X,4HTY1=1PE10.3,2X,4HTX2=1PE10	104370
		X.3,2X,4HTY2=1PE10.3,2X,4HTY1=1PE10.3,2X,4HTY2=1PE10.3//)	104380
192	630	IF(T.LT.520.0)IE=2	104390
193		IF(IE.EQ.2)ICN=5	104400
194		RETURN	104410
195		END)	104420

```

142      GO TO 470
143      440      IE=1
144              PHIN=PH
145              IF (PMAX-5000.0) 460,450,450
146      450      CONTINUE
147              PH=1.1*PH
148              GO TO 470
149      460      PH=(PMAX+PH)/2.
150      470      CLOPS=0.0
151              DEED=0.0
152              WD=0.0
153              GO TO 630
154      480      IF (UTMP .GE. UMAX) GO TO 410
155              WRITE(6,590) IFLAG
156              WRITE(6,580) IFLAG,PD(III),PDY,WDOTD,PDX2,PDY2,E1,E2
157              IE=2
158              ICHN=5
159              RETURN
160      490      CONTINUE
161              T=TO-(GAMA-1.)*UTMP*#2/(2.*GNOT*GAMA*R)
162              DT=IS-T
163              POUT=PD(III)
164              TY2=TY1
165              TY1=T
166              TE2=TE1
167              TE1=(TX1-TY1)*ZERODV(TX1)
168              ITER=ITER+1
169              IF (ITER-2) 260,500,500
170      500      IF (ITER-27) 520,520,510
171      510      WRITE(6,610) III
172              WRITE(6,620) ITER,TX1,TY1,TX2,TY2,TE1,TE2
173              IE=2
174              ICHN=5
175              RETURN
176      520      IF (KDUMP(3)) 540,540,530
177      530      WRITE(6,620) ITER,TX1,TY1,TX2,TY2,TE1,TE2
178      540      IF (ABS(TE1)-CRT) 560,560,550
179      550      CONTINUE
180              GO TO 240
181      560      P=PD(III)
182              IF (UTMP .GE. UMAX) GO TO 410
183              U=UTMP
184              AMACH=U*ZERODV(SQRT(GNOT*GAMA*R*T))
185              DELTA=WDOTD*ZERODV(12.*(AP+DAP)*U)
186              AMPN=AMAX1(AMPN,AMACH)
187      580      FORMAT(2X,6HIFLAG=12,2X,3HPD=1PE10.3,2X,4HPDY=1PE10.3,2X,6HWDOTD=1
XPE10.3,2X,5HPDX2=1PE10.3,2X,5HPDY2=1PE10.3,2X,3HE1=1PE10.3,2X,3HE2
X=1PE10.3//)
188      590      FORMAT(1X,7HICOUNT=13,1X,107HITERATION FOR INCREMENT DISCHARGE PRE
XSSURE IN SUBROUTINE AIBST HAS FAILED **EXECUTION HAS BEEN TERM[NAT
XED**)
189      600      FORMAT(//5H PIN=1PE10.3,2X,8HPD(III)=1PE10.3,2X,12HPDPR(III-1)=1PE
X10.3,2X,10HPDPR(III)=1PE10.3,2X,7HV(III)=1PE10.3,2X,9HVP(III)=1PE
X10.3,2X,6HAPHI=1PE10.3,2X,3HAP=1PE10.3,2X,2HU=1PE10.3,2X,5HUTMP=1PE1
X0.3,2X,6HWDOTI=1PE10.3,2X,6HWDOT=1PE10.3,2X,6HWDOTD=1PE10.3/3H R=

```

```

103800
103810
103820
103830
103840
103850
103860
103870
103880
103890
103900
103910
103930
103940
103950
103960
103990
104000
104010
104020
104030
104040
104050
104060
104070
104080
104090
104100
104110
104120
104130
104140
104160
104170
104180
104200
104210
104230
104240
104250
104260
104270
104280
104290
104300
104310
104320

```

I N D E X

SUBROUTINE AIBST(IE)

PAGE 30

		X1PE10.3,2X,2HT=1PE10.3,2X,5HDEL1=1PE10.3,2X,4HT11=13,2X,4HPOY=1PE1	104130
		X0.3,2X,5HTEMP=1PE10.3,2X,6HACCEL=1PE10.3//)	104140
190	610	FORMAT(25H01 ITERATION FOR INCREMENT,13,53HDISCHARGE TEMPERATURE IN	104150
		XSUBROUTINE AIBST HAS FAILED.)	104160
191	620	FORMAT(1X,5HTIER=13,2X,2HT=1PE10.3,2X,4HTY1=1PE10.3,2X,4HTX2=1PE10	104170
		X.3,2X,4HTY2=1PE10.3,2X,4HTE1=1PE10.3,2X,4HTE2=1PE10.3//)	104180
192	630	IF(T:LT.520.0)IE=2	104190
193		IF(IE.FQ.2)IC=5	104200
194		RETURN	104210
195		END)	104220

SYMBOL	-----	REFERENCES	-----
10	- 25	26*	
20	- 27	28*	
30	- 25	27	31*
40	- 31	32*	
50	- 33	34*	
90	- 31	33	36*
100	- 36	37*	
110	- 39	40*	
120	- 39	44*	
130	- 44	45*	
140	- 36	44	47*
150	- 55	56*	
160	- 55	59*	
170	- 58	60*	
180	- 61	62*	
190	- 61	66*	
200	- 68*		
210	- 67	72*	
220	- 73	74*	
230	- 73	76*	
240	- 83*	180	
250	- 83	84*	
260	- 83	86*	169
270	- 83	85	87*
280	- 91*	124	
290	- 91	92*	
300	- 91	95*	
310	- 91	94	96* 131 133 135
320	- 101	102*	
330	- 101	106*	
332	- 105	107*	
340	- 118	119*	
350	- 118	121*	
360	- 121	122*	
370	- 125*		
380	- 125	126*	
390	- 127	129	132*
410	- 136*	154	182
420	- 136	137*	
430	- 139*		
440	- 136	138	143*
450	- 145	145*	
460	- 145	149*	
470	- 142	148	150*
480	- 125	154*	
490	- 121	160*	
500	- 169	170*	
510	- 170	171*	
520	- 170	176*	
530	- 176	177*	
540	- 176	178*	
550	- 178	179*	
560	- 178	181*	

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PAGE 33

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D256-10020-4

I N D E X				SUBROUTINE AINSTR(IE)										PAGE 76	
WDDID	-	1600	51	69=	75WR	100=	101	103=	106	109	110	120WR	134	156WR	
		185													
WDDII	-	1300	51=	75WR	80	100	110								
WGTOT	-	1900													
* WDKKA	-	100													
* WDKKN	-	110													
* XLIN	-	410	420	460											
ZCALC	-	1300													
ZEROV	-	THE VARIABLE- ZEROV - IS USED BEFORE IT IS DEFINED													
	-	43	54	79	80	98	110	111	117	167	184	145			

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1      SUBROUTINE AIRSUB(IE)                                87720
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 87870
C      SUBROUTINE AIRSUB DETERMINES THE PRESSURE LOSS AND CHANGES IN THE 87890
C      GAS PROPERTIES BETWEEN INCREMENT DIVIDING PLANES DUE TO MASS 87900
C      ADDITION AND AREA CHANGE FOR THE SOLUTION OF THE INTERNAL. 87910
C      BALLISTICS NEGLECTING TRANSIENT EFFECTS (SECTION 4.1.1). 87920
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 87940
2      COMMON/CONSTS/GNOT,PI,PI02,RADIAN
3      COMMON/INPUT6/OSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
1      AMWG(20),TCOMB(20),NCSCOE
4      COMMON/INPUTN/STFLAG,STDYST,DELTST,DELTSS,DELTTO
5      COMMON/INPUTU/DELTA,PA,PHI,HCO,DELZ,KDUMP(72)
6      COMMON/DUMYD/TTMP,UTMP
7      COMMON/COMA/DELT,APHI,WDOTI,ANIBO,TIMEX,UT,ANLOPS,ACCEL,
1      ABCYL,PHNT(101,15),AINCHI,AMACH,ZCALC(101)
8      COMMON/COMG/TAUZ(101),RBZ(101),TAUZTU(101),RBZTU(101),PD(101),
1      TAUWDP(101),RB,VF,DWDOT,VP
9      COMMON/PARMH/AP,PMIN,PMAX,WDOT,I1I,I1J,WDOTO,NSLOT,NTAHE,NTMF,
1     TAUTO,T0FLAG,NINCPL,BRNOUT,IIS,IS1,IS2,NI,SCUR(19,2)
10     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
1     AMW,AKRST
11     COMMON/PARMAA/T0,IFLAG
12     IE=0                                                    87960
13     PHAH=P
14     IF(STFLAG)10,20,10
15     10 CONTINUE
16     CALL AIRST(IE)
17     RETURN
18     20 CONTINUE
19     WDOTI=WDOT
20     WDOT=WDOTI+DWDOT
21     IF(WDOT)30,1001,30
22     1001 IF(TIME-OT,0.0) GO TO 1000
23     GO TO 210
24     30 CAA=WDOT*(2.*AP-(GAMA*(APHI+AP)/(2.*GAMA)-(APHI+AP)/(2.*GAMA))) 88050
25     CBB=(APHI+AP)*GNOT*AP**2*(2.*AP*WDOTI*U 88060
26     CC=(APHI+AP)*10**2*GNOT*WDOT 88070
27     RAD=CBB**2-4.*CC*CAA 88080
28     IF(RAD)130,40,40 88090
29     40 TEMP6=1.-SORT(RAD)/CBB 88100
30     IF(TEMP6-.0001)70,50,50 88110
31     50 UTMP=CBB*TEMP6/(2.*CAA) 88120
32     IF(UTMP)70,70,60 88130
33     60 DLTMP=WDOT/(12.*AP*UTMP) 88140
34     GO TO 90 88150
35     70 DLTMP=DELTA 88160
36     80 UTMP=WDOT/(12.*AP*DLTMP) 88170
37     90 ITMP=TO-(GAMA-1.)*UTMP**2/(2.*GNOT*R*GAMA) 88180
38     XMBAR=P*(U/SORT(GNOT*R*GAMA*T)+UTMP/SORT(GNOT*R*GAMA*ITMP))
39     PTMP=P+WDOTI*J/(GNOT*APHI)-WDOT*UTMP/(GNOT*AP)-
+     2.0*GAMA*PBAR*XMBAR**2*(AP-APHI)/(AP*APHI)
40     PTMP=P-((WDOT*UTMP-WDOTI*U)*2./GNOT*(APHI+AP)) 88190
41     TEMP6=PTMP/(12.*R*ITMP) 88200
42     TEMP1=DLTMP-TEMP6 88210
43     IF(ABS(TEMP1)/DLTMP-.0001)110,110,100 88220

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44      100      OLTMP=TEMP6                      RR210
45      PMAX=0.5*(P+PTMP)
46      GO TO 80                      RR240
47      110      IF (UTMP-UT) 120,120,130      RR250
48      1000      ITMP=TU
49      PTMP=P
50      OLTMP=0.0
51      UTMP=0.0
52      120      I=ITMP                      RR260
53      P=PTMP                      RR270
54      PD(III)=PTMP                      RR280
55      DELTA=OLTMP                      RR290
56      U=UTMP                      RR300
57      GO TO 190                      RR310
58      130      PMIN=PH                      RR320
59      TEMP6=PH+PMI                      RR330
60      IF (TEMP6-PMAX) 140,150,150      RR340
61      140      PH=TEMP6                      RR350
62      GO TO 160                      RR360
63      150      PH=(PMAX+PMIN)*.9+PMIN      RR370
64      160      TEMP1=PMAX/1000000.          RR380
65      IF (ABS(PMAX-PMIN)-TEMP1) 160,180,170      RR390
66      170      IE=1                      RR400
67      GO TO 210                      RR410
68      180      PH=PMAX                      RR420
69      PMIN=PMAX                      RR430
70      GO TO 170                      RR440
71      190      TEMP1=GAMA-1.              RR450
72      TEMP6=SQRT((TU-TTMP)*2./(TEMP1+TTMP))      RR460
73      AMACH=TEMP6                      RR470
74      IF (TEMP6-AMPN) 210,210,200      RR480
75      200      AMPN=TEMP6                      RR490
76      210      IF (KOUNP(3)) 240,240,220      RR500
77      220      WRITE (6,230) P,APHI,AP,DELTA,U,R,T,WOUT1,WOUT,DWDDT,III      RR510
78      230      FORMAT (/3H P=1PE10.3,2X,5HAPHI=1PE10.3,2X,3HAP=1PF10.3,2X,6HDELTA      RR520
      A=1PE10.3,2X,PHU=1PF10.3,2X,PHR=1PE10.3,2X,2HI=1PE10.3,2X/7H WDDT1=      RR530
      X1PF10.3,2X,5HDDOT=1PE10.3,2X,6HDDDDOT=1PE10.3,2X,4HIII=1//)      RR540
79      240      RETURN                      RR550
80      END

```

10255-10920-4

BAGT 40

	DELFL	-	500																
	DELI	-	700																
	DELTA	-	1000	35	55=	77WH													
	DEL7SS	-	400																
	DEL7ST	-	400																
	DEL7TO	-	400																
	DELZ	-	500																
	DIS	-	1000																
*	DLTMP	-	33=	35=	36	42	43	44=	50=	55									
	DUMYD	-	6*																
	DWDOT	-	800	20	77WH														
	DAMA	-	300	24	37	38	39	71											
	DAMAG	-	300																
	GNOT	-	200	25	26	37	38	39	40										
	HCO	-	500																
	IE	-	146	12=	15AG	56=													
	IFLAG	-	1100																
	III	-	900	54	77WH														
	IIJ	-	900																
	IIS	-	900																
*	INPUTG	-	3*																
*	INPUTM	-	4*																
*	INPUTU	-	5*																
	ISI	-	900																
	IS2	-	900																
	KDUMP	-	500	16															
	NCSCOF	-	300																
	NCSTK	-	300																
	VI	-	900																
	NINCLPL	-	900																
	NSLOT	-	900																
	NTABL	-	900																
	NIME	-	900																
	P	-	1000	13	25	34	40	45	49	53=	77WH								
	PA	-	500																
*	PARMAA	-	11*																
*	PARMB	-	9*																
*	PARMF	-	10*																
	PBAR	-	13=	39	45=														
	PD	-	800	54=															
	PH	-	1000	54	59	61=	53=	68=											
	PHI	-	500	59															
	PJ	-	200																
	PI02	-	200																
	PMAX	-	900	60	63	64	65	68	69										
	PMIN	-	900	58=	63	65	59=												
	PON	-	1000																
	PRESS	-	300																
	PRNI	-	700																
	PTMP	-	39=	40=	41	45	49=	53	54										
	R	-	300	26	37	38	41	77WH											
	RAU	-	27=	28	29														
	RADIAN	-	200																
	RB	-	800																
	RBZ	-	800																

3-47

2250-1 M.2 -3


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1      SUBROUTINE AIGSUB                                     65930
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 65940
C      SUBROUTINE AIGSUB DETERMINES THE SURFACE AREA AROUND THE IGNITER 66010
C      OPENING IN THE HEAD END SECTION (SECTIONS.2.1.2). 66020
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66040
2      COMMON/CONST/6NOT,PI,PI02,RADIAN
3      COMMON/INPUTA/BTAE,PH,SH,ADHM,RIG,MMH
4      COMMON/COMF/TAH,RC,SUMDV,XR,HE,AL(13),XBARIH,ASF,AFF,WI,WT,HA,
1      RAD,ALL,AJPP,ASI
5      COMMON/PARMH/BIE,BOE,AAVN,BK,RXX,AS11,DELLRI,ROPE4,AIE,YPI,ZPI,
1      ARCO,ARCL,RDE1,ALITTL,ZI,AIG,THRI,THRO,AOF
6      IF(RIG)20,10,20                                     66060
7      AIG=0.                                                66070
8      GO TO 50
9      20 YNU=SQRT(BOE**2-RIG**2/BTAE**2)                  66080
10     ARN=1.570795-ACOS(RIG/SQRT((BTAE**2-YNU)**2-RIG**2)) 66090
11     IF((BIE-BOE)/LOS(ARN)-TAJ).30,40,40                66110
12     30 AIG=0.                                             66120
13     GO TO 50
14     40 AIG=(RIG**2.+(AOF*SIN(ARN))**3.)*4159*TAU*ARN/(2.*AAVN) 66140
15     50 RETURN                                             66150
16     END

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I N D E X

SUBROUTINE AIGSUB

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SYMBOL		REFERENCES									
10	-	6	7*								
20	-	6	9*								
30	-	11	12*								
40	-	11	14*								
50	-	8	13	15*							
AANN	-	5C0	14								
THE VARIABLE- ACOS -IS USED BEFORE IT IS DEFINED											
ACOS	-	10									
AFF	-	4C0									
AIG	-	5C0	7=	12=	14=						
* AIGSUB	-	1*									
AJPP	-	4C0									
AL	-	4C0									
ALITTL	-	5C0									
ALL	-	4C0									
AOE	-	5C0									
AOHM	-	3C0									
ARCO	-	5C0									
ARCI	-	5C0									
ARN	-	10=	11	14							
ASE	-	4C0									
ASI	-	4C0									
ASII	-	5C0									
AIE	-	5C0									
OH	-	3C0									
BOE	-	5C0	9	11							
BTAD	-	3C0	9	10							
DX	-	5C0									
BIE	-	5C0	11								
* COMI	-	4*									
* CONSTS	-	2*									
* COS	-	11									
DELLRI	-	5C0									
DM1	-	3C0									
DN01	-	2C0									
HE	-	4C0									
HHH	-	3C0									
* INPUTA	-	3*									
* PARMH	-	5*									
PI	-	2C0									
PIO2	-	2C0									
RA	-	4C0									
RADIAN	-	2C0									
RAU	-	4C0									
RC	-	4C0									
* RETURN	-	15*									
RIG	-	3C0	6	9	10	14					
ROE1	-	5C0									
ROPE4	-	5C0									
RXX	-	5C0									
* SIN	-	14									
* SQRT	-	9	10								
SUMOV	-	4C0									

INDEX

SUBROUTINE AIGSUB

Page 44

TAU	"	400	11	14
THH1	"	500		
THH0	"	500		
WI	"	400		
WT	"	400		
XBAR1H	"	400		
XR	"	400		
YNO	"	9=	10	
VPI	"	500		
ZI	"	500		
ZPI	"	500		

I N D E X

SUBROUTINE ALRSUB(RT,ALRS,GAMAT,ALR)

PAGE 45

```

1      SUBROUTINE ALRSUB(RT,ALRS,GAMAT,ALR) . 60580
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 60600
      C SUBROUTINE ALRSUB DETERMINES THE ARC LENGTH OF A SECTOR IN THE END 60620
      C SECTIONS FROM THE MINIMUM POINT OF A SECTOR TO A GENERAL POINT 60630
      C ALONG THE PERIMETER OF THE SECTOR (SECTION 5.2.3.2). 60640
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 60660
2      IF (RT) 20,10,20. 60680
3      10 ALR=ALRS 60690
4      GO TO 30 60700
5      20 GAMAT=2.*ACOS(SQRT((ABS(RT)*2.)*2-ALRS**2)/(2.*ABS(RT))) 60710
6      ALR=GAMAT*ABS(RT) 60720
7      30 RETURN 60730
8      END 60740

```

SYMBOL	-----	REFERENCES	-----
10	-	2	3*
20	-	2	5*
30	-	4	7*
* ARS	-	5	6
THE VARIABLE ACUS - IS USED BEFORE IT IS DEFINED			
ACUS	-	5	
ALR	-	146	3= 5=
ALRS	-	146	3 5
* ALRSUB	-	1*	
GAMAT	-	146	5= 6
* RETURN	-	7*	
RT	-	146	2 5 6
* SQRT	-	5	

I N D E X

SUBROUTINE ARSSUB(XR,XRO,RA,RAO,ALRS)

PAGE 47

1	SUBROUTINE ARSSUB(XR,XRO,RA,RAO,ALRS)-	60750
	CC	60770
C	SUBROUTINE ARSSUB DETERMINES THE CHORD LENGTH BETWEEN THE MINIMUM	60790
C	POINT OF A SECTOR AND A GENERAL POINT ALONG THE PERIMETER OF THE	60800
C	SECTOR (SECTION 5.2.3.2).	60810
	CC	60830
2	TEMP1=(XR-XRO)**2	60850
3	TEMP2=SQRT(RAO**2-XRO**2)	60860
4	TEMP3=SQRT(RA**2-XR**2)-TEMP2	60870
5	ALRS=SQRT(TEMP3**2+TEMP1)	60880
6	RETURN	60890
7	END	

SYMBOL			REFERENCES		
	ALRS	=	1AG	5=	
✓	ARSSUB	=	1*		
	RA	=	1AG	4	
	RAO	=	1AG	3	
•	RETURN	=	6*		
•	SORT	=	3	4	5
	TEMP1	=	2=	5	
	TEMP2	=	3=	4	
	TEMP3	=	4=	5	
	XR	=	1AG	2	4
	XRO	=	1AG	2	3

1	SUBROUTINE ASESUB	60910
	CC	61040
C	SUBROUTINE ASESUB SETS UP THE CURRENT EQUATIONS FOR	61060
C	SUBROUTINES XRSUB AND RASUB AND ASSIGNS FOR EACH SECTOR THE PROPER	61070
C	VALUES FOR THE COORDINATES OF THE ORIGIN OF THE CIRCULAR ARC (RAO,	61080
C	XAO), THE RADIUS OF CURVATURE OF THE SECTOR (RT), AND THE	61090
C	PERIMETER LENGTH (AL) OF THE SECTOR (SECTION 5.2.3.2).	61100
	CC	61120
2	COMMON/INPUTC/AK,AKK,DLRF,DRVRF	
3	COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KDUMP(72)	
4	COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,	
	ALS1,ALS2,ALA,ALB,ALE,AW(5)	
5	COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RHZTO(101),PD(101),	
	TAUWDP(101),RH,VF,DWDOT,VP	
6	COMMON/COMP/DELL,RT,AL4IN,AW,RAMIN,ALX,ALAMDA	
7	COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,	
	RAO,ALL,AJPP,ASI	
8	COMMON/PARMH/AP,PHIN,PWAX,WDOT,III,IIJ,WDOT,NSLOT,NTARE,NTME,	
	TAUTO,TOFLAG,NINCPL,ARNOUT,II,ISI,IS2,NT,SCUR(18,2)	
9	COMMON/PARMU/KRASUB,KXRSUB,AJBB,HEI,AJBN,AJBH,XBARI	
10	COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PUN,JIS,AMPN,AT,	
	AMW,AKHSI	
11	COMMON/PARMAB/HSUBMG,NSUBMG,NEND,ASEA,ASEB,SUMDVA,SUMDVH	
12	COMMON/PARMAC/HEA,HEB,AEEA,AEEB,DVA,DVB,HEIA,HEIB,AWEA,AWEB,DELLH	
13	ASE=0.	61140
14	SUMDV=0.	61150
15	ASEA=0.0	
16	ASEB=0.0	
17	SUMDVA=0.0	
18	SUMDVH=0.0	
19	IF(NTARE.GT.1)RETURN	61160
20	CALL RCSUB	61170
21	50 ALX = AL(1)	61180
22	DELL=DLRF*RF	61190
23	RT=R2-TAU	61200
24	KRASUB=1	61210
25	KXRSUB=1	61220
26	CALL AEPSUB	61230
27	ALX=AL(2)	61240
28	RT=0.	61250
29	KRASUB=2	61260
30	KXRSUB=2	61270
31	CALL AEPSUB	61280
32	ALX=AL(3)	61290
33	RT=R3-TAU	61300
34	KRASUB=3	61310
35	KXRSUB=3	61320
36	CALL AEPSUB	61330
37	ALX=AL(4)	61340
38	RT=0.	61350
39	KRASUB=4	61360
40	KXRSUB=4	61370
41	CALL AEPSUB	61380
42	ALX=AL(5)	61390
43	RT=R4-TAU	61400

44		KRASUB=5	61410
45		KXRSUB=5	61420
46		CALL AEPSUB	61430
47		ALX=AL(6)	61440
48		RT=0.	61450
49		KRASUB=6	61460
50		KXRSUB=6	61470
51		CALL AEPSUB	61480
52		ALX=AL(7)	61490
53		RT=-R5-TAU	61500
54		KRASUB=7	61510
55		KXRSUB=7	61520
56		CALL AEPSUB	61530
57		IF (TAUW-TAU) 70,60,60	61540
58	60	CALL AWESUB	61550
59		ASE=ASE+AWE	61560
60		IF (NEND.EQ.1,OK,NSUMMG.EQ.0) GO TO 70	
61		ASEA = ASEA + AWEA	
62		ASEH = ASEH + AWEH	
63	70	ALX=AL(9)	61570
64		RT=-R6-TAU	61580
65		KRASUB=9	61590
66		KXRSUB=9	61600
67		CALL AEPSUB	61610
68		ALX=AL(10)	61620
69		RT=0.	61630
70		KRASUB=10	61640
71		KXRSUB=10	61650
72		CALL AEPSUB	61660
73		ALX=AL(11)	61670
74		RT=R7-TAU	61680
75		KRASUB=11	61690
76		KXRSUB=11	61700
77		CALL AEPSUB	61710
78		ALX=AL(12)	61720
79		RT=0.	61730
80		KRASUB=12	61740
81		KXRSUB=12	61750
82		CALL AEPSUB	61760
83		ALX=AL(13)	61770
84		RT=R8-TAU	61780
85		KRASUB=13	61790
86		KXRSUB=13	61800
87		CALL AEPSUB	61810
88		IF (ASE) 80,90,90	61820
89	80	ASE=0.	61830
90		ASEA=0.0	
91		ASEH=0.0	
92	90	KDP = 2	61840
93		RHZ(11J)=RBZ(11J)	61850
94		IF (KDP) 100,120,100	61860
95	100	WRITE(6,110)KDP,11I,11J,TAUZ(11I),RBZ(11J),	61870
		X,SUMDV,VF,ASE,AP,WDOT,DWDOT	61880
96	110	FORMAT(4H STA 13,3X,2I5,1P9E10.2)	61890
97	120	CONTINUE	61900

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I N D E X

SUBROUTINE ASESUB

PAGE 51

98
99 RETURN
END

61910

SYMBOL	-----	REFERENCES	-----
50	"	21*	
60	"	57	58*
70	"	57	60 63*
80	"	88	89*
90	"	88	92*
100	"	94	95*
110	"	95WR	96*
120	"	94	97*
AEEA	"	12C0	
AEEB	"	12C0	
* AEP>UB	"	26*	31* 36* 41* 46* 51* 56* 67* 72* 77* 82* 87*
AFF	"	7C0	
AINC	"	4C0	
AINCW	"	10C0	
AJB0	"	9C0	
AJBH	"	9C0	
AJBW	"	9C0	
AJPP	"	7C0	
AK	"	2C0	
AKGY	"	10C0	
AKK	"	2C0	
AKKST	"	10C0	
AL	"	7C0	21 27 32 37 42 47 52 63 64 73 74 83
ALA	"	4C0	
ALAMDA	"	6C0	
ALAMIN	"	6C0	
ALB	"	4C0	
ALC	"	4C0	
ALL	"	7C0	
ALS1	"	4C0	
ALS2	"	4C0	
ALX	"	6C0	21= 27= 32= 37= 42= 47= 52= 63= 64= 73= 74= 83=
AMPV	"	10C0	
AMW	"	10C0	
ANU	"	4C0	
AP	"	9C0	95WR
ASE	"	7C0	13= 59= 48 89= 95WR
ASEA	"	11C0	15= 61= 90=
ASEB	"	11C0	16= 62= 91=
* ASESUB	"	1*	
ASI	"	7C0	
AT	"	10C0	
AW	"	4C0	
AWL	"	6C0	59
AWLA	"	12C0	61
AWLB	"	12C0	62
* AWESUB	"	58*	
* BRNJUT	"	8C0	
* COMG	"	5*	
* COMP	"	6*	
* COMT	"	7*	
DELF	"	3C0	
DELH	"	12C0	

I N D E X

SUBROUTINE ASESUB

PAGE 53

DELL	-	600	22=															
DELTA	-	1000																
DELZ	-	300																
DIS	-	1000																
DLRF	-	200	22															
DRVRF	-	200																
DVA	-	1200																
DVB	-	1200																
DWDOT	-	500	95WR															
HCO	-	300																
HE	-	700																
HEA	-	1200																
HEB	-	1200																
HEI	-	900																
HEIA	-	1200																
HEIB	-	1200																
HSUBMG	-	1100																
III	-	800	95WR															
IIJ	-	800	93	95WR														
IIS	-	800																
* INPUTC	-	2*																
* INPUTU	-	3*																
IS1	-	800																
IS2	-	800																
KDP	-	92=	95WR															
KDUMP	-	300	94															
KHASUB	-	900	24=	29=	34=	39=	44=	49=	54=	65=	70=	75=	80=	85=				
KXRSUB	-	900	25=	30=	35=	40=	45=	50=	55=	66=	71=	76=	81=	86=				
NEND	-	1100	60															
NI	-	800																
NINCPL	-	800																
NSLOT	-	800																
NSUBMG	-	1100	60															
NTABE	-	800	19															
NTME	-	800																
P	-	1000	95WR															
PA	-	300																
* PARMAB	-	11*																
* PARMAC	-	12*																
* PARMB	-	8*																
* PARMD	-	9*																
* PARMF	-	10*																
PD	-	500																
PH	-	1000																
PHI	-	300																
PMAX	-	800																
PMIN	-	800																
PON	-	1000																
RA	-	700																
RAMIN	-	600																
RAO	-	700																
RB	-	500																
RBZ	-	500	93=	95WR														
RBZTO	-	500																
RC	-	700																

I N D E X

SUBROUTINE AS&SUB

PAGE 54

* RCSUB	=	20*												
* RETURN	=	19*	98*											
RF	=	400	22											
RT	=	600	23=	28=	33=	39=	43=	48=	53=	64=	69=	74=	79=	84=
R2	=	400	23											
R3	=	400	33											
R4	=	400	43											
R5	=	400	53											
R6	=	400	64											
R7	=	400	74											
RB	=	400	84											
SCUR	=	800												
SUMDV	=	700	14=	95WR										
SUMDVA	=	1100	17=											
SUMDVH	=	1100	18=											
T	=	1000												
TAU	=	700	23	33	43	53	57	64	74	84				
TAUTO	=	300												
TAUW	=	400	57											
TAUWDP	=	500												
TAUZ	=	500	95WR											
TAUZTD	=	500												
TIME	=	1000												
TJFLAG	=	800												
U	=	1000												
VF	=	500	95WR											
VP	=	500												
WDDT	=	800	95WR											
WDDTD	=	800												
WI	=	700												
WONKA	=	4*												
WT	=	700												
XBAKI	=	900												
XBAKIH	=	700												
XR	=	700												

INDEX

FUNCTION ASIN(X)

PAGE 55

```

1  FUNCTION ASIN(X)
2  ASIN = 3.1415927 / 2. - ACOS(X)
3  RETURN
4  END

```

630
640
650

SYMBOL ----- REFERENCES -----

THE VARIABLE- ACOS -IS USED BEFORE IT IS DEFINED

* ACOS - 2
* ASIN - 1* 2=
* RETURN - 3*
* A - 1AG 2

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I N D E X

SUBROUTINE ASTSUB

PAGE 58

SYMBOL	-----	REFERENCES	-----
10	-	31	32*
20	-	32WR	33*
30	-	31	34*
AFF	-	7CO	
AINC	-	4CO	
AINCW	-	10CO	
AJBH	-	9CO	24
AJBM	-	9CO	
AJBW	-	9CO	
AJPP	-	7CO	23
AJSIB	-	5CO	24=
AJSIP	-	5CO	23=
AKGY	-	10CO	
AKRST	-	10CO	
AL	-	7CO	
ALA	-	4CO	
ALB	-	4CO	
ALE	-	4CO	
ALL	-	7CO	
ALS1	-	4CO	
ALS2	-	4CO	
AMPV	-	10CO	
AMW	-	10CO	
AND	-	4CO	
AOHM	-	2CO	
AP	-	8CO	32WR
ASE	-	7CO	32WR
ASI	-	7CO	
ASTSUB	-	1*	
AT	-	10CO	
AW	-	4CO	
BH	-	2CO	11
BHOLD	-	5CO	11=
BRNOUT	-	8CO	
BTAUE	-	2CO	12
COMD	-	5*	
COMG	-	6*	
COMI	-	7*	
DELF	-	3CO	
DELTA	-	10CO	
DELZ	-	3CO	
UHI	-	2CO	
DIS	-	10CO	
DWOUT	-	6CO	32WR
ENDCSB	-	18*	
HCO	-	3CO	
HE	-	7CO	
HEI	-	9CO	
HHR	-	2CO	
IE	-	1HAG	
III	-	8CO	32WR
IIJ	-	8CO	29
IIS	-	8CO	32WR

3-53

R235-10020-1

I N D E X

SUBROUTINE ASTSUB

PAGE 59

*	INPUTA	-	2*			
*	INPUTU	-	3*			
	IS1	-	8C0			
	IS2	-	8C0			
	K	-	20=	21AG		
	KDP	-	30=	J2WR		
	KDUMP	-	3C0	31		
	KRASUB	-	9C0			
	KXRSUB	-	9C0			
	NI	-	8C0			
	NINCPL	-	8C0			
	NSLOT	-	8C0			
	NTABE	-	8C0			
	NTME	-	8C0			
	P	-	10C0	32WR		
	PA	-	3C0			
*	PARMB	-	8*			
*	PARMD	-	9*			
*	PARMF	-	10*			
	PD	-	6C0			
	PH	-	10C0			
	PHI	-	3C0			
	PMAX	-	8C0			
	PMIN	-	8C0			
	PON	-	10C0			
*	PT1AA	-	21*			
	RA	-	7C0			
	RAD	-	7C0			
	RB	-	6C0			
	RBZ	-	6C0	29=	32WR	
	RBZTO	-	6C0			
	RC	-	7C0			
*	RETURN	-	35*			
	RF	-	4C0	15	16=	28=
	RGF	-	5C0			
	RGFM	-	5C0			
	RG1	-	5C0			
	RG1B	-	5C0			
	RHOLD	-	5C0	15=	16	28
	RIG	-	2C0			
	R2	-	4C0			
	R3	-	4C0			
	R4	-	4C0			
	R5	-	4C0			
	R6	-	4C0			
	R7	-	4C0			
	R8	-	4C0			
	SCUR	-	8C0			
	SUMDV	-	7C0	32WR		
	T	-	10C0			
	TAU	-	7C0	17	19=	
	TAUHD	-	13=	16	27	
	TAUTO	-	8C0			
	TAUW	-	4C0	13	14=	27=
	TAUWDP	-	6C0			

INDEX

SUBROUTINE ASTSUB

PAGE 60

IAU2	-	5CD	32WR
IAU2TO	-	6CD	
THOLD	-	17=	19
TIME	-	10CD	
TGFLAG	-	ACD	
U	-	10CD	
VF	-	6CD	32WR
VP	-	6CD	
WDOT	-	8CD	32WR
WDOTD	-	8CD	
W1	-	7CD	
WURKA	-	4#	
WT	-	7CD	25
WTS?	-	5CD	25=
XBAKI	-	9CD	
XHARIN	-	7CD	22
XHARST	-	5CD	22=
XR	-	7CD	

```

1      SUBROUTINE ASUBC                                     66170
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66240
C      SUBROUTINE ASUBC SETS UP THE CORRECT VARIABLES AND EQUATIONS TO 66260
C      DETERMINE THE COORDINATES (X, Y, AND Z) OF THE POINTS POA, P1A, 66270
C      AND P3A FOR THE BLOCK 1 ANALYSIS IN SUBROUTINE SCI (SECTION 5.2.1. 66290
C      1). 66290
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66310
2      COMMON/XOAWOR/RAA,XHATA,THRA,GAMA1A,GAMA2A,XOA,YOA,ZOA,X2A,Y2A,
1          Z2A,X1A,Y1A,Z1A,X3A,Y3A,Z3A,TANG2A,SINTRA,COSTRA,
2          TANP1A,AAAA,HA,CA,DA,BTAOA,SINGA2,COSGA2,SINGA1,
3          COSGA1,ALTA
3      COMMON/XOWORK/XO,YO,ZO,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTHR,
1          COSTHR,TANPH1,AO,BO,CO,DO,HFAO,SJNGM2,COSGM2,
2          SINGM1,COSGM1,ALTO
4      COMMON/PARMM/RAT,XRAT,THR,GAMA1,GAMA2,Z1AT
5      COMMON/PARMS/ICHN
6      CALL HASUBH                                         66340
7      RAA=RAT                                             66340
8      CALL XRSUBH                                         66350
9      XRATA=XRAT                                          66360
10     CALL THETAR(RAT,XRAT,THR)                          66370
11     THRA=THR                                            66380
12     CALL GAMSUB                                          66390
13     GAMA1A=GAMA1                                        66400
14     CALL GAMA2S                                          66410
15     GAMA2A=GAMA2                                        66420
16     IF (ICHN.EQ.5) GO TO 10                             66430
17     CALL PUSUB                                           66440
18     CALL PISUB                                           66450
19     CALL PJSUB                                           66460
20     I77 = 38                                             66470
21     CALL TRAN(XO,XOA,I77)                               66480
22     RETURN                                              66490
23     FND

```

SYMBOL	-----	REFERENCES	-----
10	"	15	22*
AAAA	"	2C0	
ALTA	"	2C0	
ALTO	"	3C0	
AO	"	3C0	
* ASUBC	"	1*	
BA	"	2C0	
BO	"	3C0	
BTA0	"	3C0	
BTA0A	"	2C0	
CA	"	2C0	
CO	"	3C0	
COSGA1	"	2C0	
COSGA2	"	2C0	
COSGM1	"	3C0	
COSGM2	"	3C0	
COSTHR	"	3C0	
COSTRA	"	2C0	
DA	"	2C0	
DO	"	3C0	
GAMA1	"	4C0	13
GAMA1A	"	2C0	13=
GAMA2	"	4C0	15
GAMA2A	"	2C0	15=
* GAMA2S	"	14*	
* GAMSUB	"	12*	
ICHN	"	5C0	16
IZZ	"	20=	21AG
* PARMM	"	4*	
* PARMS	"	5*	
* POSUB	"	17*	
* P1SUB	"	18*	
* P3SUB	"	19*	
RAA	"	2C0	7=
* RASUBR	"	6*	
RAT	"	4C0	7 10AG
* RETURN	"	22*	
SINGA1	"	2C0	
SINGA2	"	2C0	
SINGM1	"	3C0	
SINGM2	"	3C0	
SINTHR	"	3C0	
SINTRA	"	2C0	
TANGM2	"	3C0	
TANG2A	"	2C0	
TANPH1	"	3C0	
TANP1A	"	2C0	
* THE FAR	"	10*	
THR	"	4C0	10AG 11
THRA	"	2C0	11=
* TRAN	"	21*	
XO	"	3C0	21AG
XOA	"	2C0	21AG

I N D E X

SUBROUTINE ASUBC

PAGE 63

*	XOAWOR	-	2*		
*	XOWORK	-	3*		
	XRAT	-	4C0	9	10AG
	XDATA	-	2C0	9*	
*	XRSUBB	-	8*		
	X1	-	3C0		
	X1A	-	2C0		
	X2	-	3C0		
	X2A	-	2C0		
	X3	-	3C0		
	X3A	-	2C0		
	Y0	-	3C0		
	Y0A	-	2C0		
	Y1	-	3C0		
	Y1A	-	2C0		
	Y2	-	3C0		
	Y2A	-	2C0		
	Y3	-	3C0		
	Y3A	-	2C0		
	Z0	-	3C0		
	Z0A	-	2C0		
	Z1	-	3C0		
	Z1A	-	2C0		
	Z1AT	-	4C0		
	Z2	-	3C0		
	Z2A	-	2C0		
	Z3	-	3C0		
	Z3A	-	2C0		

```

1      SUBROUTINE AWESUB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      SUBROUTINE AWESUB DETERMINES THE TOTAL BURNING SURFACE AREA OF THE
C      WTB ZONE AT THICKNESS TAU AND THE BURNING SURFACE AREA OF SECTION
C      8 FOR THE END SECTIONS (SECTION 5.2.3.2.4).
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
2      COMMON/CONSTS/GNDF,PI,PI02,RADIAN
3      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3          TH3,TH4,B71M,B72M,B91M,B92M
4      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALH,ALE,AN(S)
5      COMMON/WORKDE/DE1,HE,ADEN
6      COMMON/WORKRE/RE1,ALFEM,ALFE,RE2,HE1,HE2,HE3,HER,VFE0,VCF,
1          TAU0,TAUE1,CAE,CHE,CCCE,CCVE,CUCE,CUVE,CECE,CFVE
7      COMMON/WORKX/X0,Y0,Z0,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTHR,
1          COSTHR,TANPHI,AU,H0,C0,U0,RA0,SINSH2,COSGM2,
2          SINGM1,COSGM1,ALTO
8      COMMON/COMP/DELL,RT,ALAMIN,AWE,RAMIN,ALX,ALAMDA
9      COMMON/COMS/TPH,AKRADJ,IEND
10     COMMON/COMT/TAU,RC,SUMDV,XR,HF,AL(13),XRAMIN,ASE,AFF,W1,WT,RA,
1         RA0,ALL,AJPP,ASI
11     COMMON/PANMAB/HSUMMG,VSJHMG,NEH,ASEA,ASEH,SUMDVA,SUMDVH
12     COMMON/PANMAC/HEA,HFH,AEEA,AEEH,DVA,DVH,HEIA,HFIB,AWFA,AWFH,DELI
13     HSUMMG=HSUMMG-DELI
14     RA0=HF-TAUW+TAU
15     RA=RA0
16     CALL HESUB
17     AWE=2.*ANO*AL(H)*HE
18     AEA=2.*ANO*AL(8)*HEA
19     AWE3=2.*ANO*AL(8)*HEH
20     IF(RF1-RAU)20,20,10
21     10 AWE=AWE+ANO*TH1*(RE1**2-RA0**2)
22     IF(HE.LE.(HSUMMG)) GO TO 14
23     AWE3=AWE3+ANO*TH1*(RE1**2-RA0**2)
24     GO TO 16
25     14 AEA=AEA+ANO*TH1*(RE1**2-RA0**2)
26     16 SUMDV=SUMDV+PI*HE*(RE1**2-RA0**2)
27     SUMDVA=SUMDVA+PI*HEA*(RE1**2-RA0**2)
28     SUMDVH=SUMDVH+PI*HEH*(RE1**2-RA0**2)
29     RAMIN=RE1
30     GO TO 30
31     20 RAMIN=RAU
32     30 IF(RC-RAMIN)70,70,40
33     40 ALAMIN=ACOS(SQRT(TAU**2-(RAMIN-RE1)**2)/TAU)
34     ALAMDA=ACOS(SQRT(TAU**2-(RC-RE1)**2)/TAU)
35     TEMP1=ALAMDA-ALAMIN
36     IF(TEMP1-0.1)50,50,60
37     50 TEMP1=0.1
38     60 RA=RE1+2.*TAU*SIN(TEMP1/2.)*SIN((ALAMDA+ALAMIN)/2.)/TEMP1
39     AWE=AWE+2.*ANO*TH1*RA*TAU*(ALAMDA-ALAMIN)
40     IF(HE.LE.(HSUMMG)) GO TO 64
41     AWE3=AWE3+2.*ANO*TH1*RA*TAU*(ALAMDA-ALAMIN)
42     GO TO 66

```

61930
62040
62060
62070
62080
62100

62120
62130
62140
62150
62160
62170

62190
62200
62210
62220
62230
62240
62250
62260
62270
62280
62290

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43      64 AWEA=AWEA+2.*RAN0*TH1*RA*TAUP*(ALAMDA-ALAMIN)
44      66 TAUSQ=TAU**2
45      TEMP6=(ALAMDA-ALAMIN)*TAJSQ
46      TEMP1=RE1-RAMIN
47      TEMP5=TEMP1*SQRT(TAUSQ-TEMP1**2)
48      TEMP2=RE1-RC
49      TEMP6=PI*RE1*(SQRT(TAUSQ-TEMP2**2)*TEMP2-TEMP5-TEMP6)
50      TEMP1=TAUSQ-TEMP1**2
51      TEMP1=SQRT(TEMP1**3)
52      TEMP2=TAUSQ-TEMP2**2
53      TEMP5=(SQRT(TEMP2**3)-TEMP1)*2.*3.14159/3.
54      SUMDV=SUMDV*(RC**2-RAMIN**2)*HER*3.14159*(TEMP5+TEMP6)
55      70 IF(RC-RA0)90,90,80
56      80 RAMIN=RC
57      60 TO 100
58      90 RAMIN=RA0
59      100 ALITBE=RF/BE
60      IF(HE2-RAMIN)130,130,110
61      110 HEFC=(HE2-RAMIN)*HE1/(RE2-RE1)
62      120 TEMP6=(HEFC+HER-HE1)*RAMIN**2
63      TEMP5=(RAMIN**2+RE2*RAMIN+RE2**2)*HEFC/3.
64      TEMP4=(HER-HE0)*RF**2
65      TEMP7=((ALITBE**2*HE2-HE2**3/3.)*BE**2.+TEMP4+TEMP5
        *-TEMP6)*PI
66      SUMDV=SUMDV+TEMP7
67      IF(NEND.EQ.1.OR.NSUBMG.EQ.0) GO TO 150
68      IF(HSUBMG.GT.DELH) GO TO 121
69      TEMPB=PI*(RF**2-RAMIN**2)*HSUBMG
70      SUMDVA=SUMDVA+TEMPB
71      SUMDVB=SUMDVB+TEMP7-TEMPB
72      60 TO 150
73      121 IF(HSUBMD.GT.HE2) GO TO 122
74      TEMP8=((ALITBE**2*HSUBMD-HSUBMD**3/3.)*BE**2.+TEMP4
        *-TEMP6)*RAMIN**2)*PI
75      SUMDVA=SUMDVA+TEMPB
76      SUMDVB=SUMDVB+TEMP7-TEMPB
77      60 TO 150
78      122 IF(HSUBMD.GE.(HE2+HEFC)) GO TO 124
79      TEMP8=((ALITBE**2*HE2-HE2**3/3.)*BE**2.+TEMP4*(RAMIN**2
        +HE2*RAMIN+RE2**2)*(HSUBMD-HE2)/3.-HSUBMG)*RAMIN**2)*PI
80      SUMDVA=SUMDVA+TEMPB
81      SUMDVB=SUMDVB+TEMP7-TEMPB
82      60 TO 150
83      124 SUMDVA=SUMDVA+TEMP7
84      60 TO 150
85      130 Z1=SQRT(RF**2-RAMIN**2)/BE
86      140 TEMP6=(Z1+HER-HE0)*RAMIN**2
87      TEMP5=(HER-HE0)*RF**2
88      TEMP7=((ALITBE**2*Z1-Z1**3/3.)*BE**2+TEMP5-TEMP6)*PI
89      SUMDV=SUMDV+TEMP7
90      IF(NEND.EQ.1.OR.NSUBMG.EQ.0) GO TO 150
91      IF(HSUBMG.GT.DELH) GO TO 141
92      TEMPB=PI*(RF**2-RAMIN**2)*HSUBMG
93      SUMDVA=SUMDVA+TEMPB
94      SUMDVB=SUMDVB+TEMP7-TEMPB

```

62310

62320

62330

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62400

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62500

I N D E X

SUBROUTINE A#ESUA

PAGE 46

```
95      GO TO 150
96      141 IF (Z1.LE.#SUBMD) GO TO 144
97      ZA1=H#SUBMD
98      TEMP8=((ALIT3E**2*7A1-ZA1**3/3.)#BE**2+TEMP5-(ZA1+#E4
      $-HEO)*RAHIN**2)*PI
99      SUMDVA=SUMDVA+TEMP8
100     SUMDVB=SUMDVB+TEMP7-TEMP8
101     GO TO 150
102     144 SUMDVA=SUMDVA+TEMP7
103     150 CONTINUE
104     RETURN
105     END
```

SYMBOL	-----	REFERENCES	-----
10	-	20	21*
14	-	22	25*
16	-	24	26*
20	-	20	31*
30	-	30	32*
40	-	32	33*
50	-	36	37*
60	-	36	38*
64	-	40	43*
66	-	42	44*
70	-	32	55*
80	-	55	56*
90	-	55	58*
100	-	57	59*
110	-	60	61*
120	-	62*	
121	-	68	73*
122	-	73	78*
124	-	78	83*
130	-	60	85*
140	-	86*	
141	-	91	96*
144	-	96	102*
150	-	67	72
A	-	300	77
THE VARIABLE ACUS - IS USED BEFORE IT IS DEFINED			
ACOS	-	33	82
AELA	-	1200	84
AEEB	-	1200	90
AFF	-	1000	95
AJNC	-	400	101
AJPP	-	1000	103*
AKRADJ	-	900	
AL	-	1000	
ALA	-	400	
ALAMDA	-	800	
ALAMIN	-	800	
ALB	-	400	
ALC	-	300	
ALD	-	300	
ALE	-	400	
ALFE	-	600	
ALFEM	-	600	
ALITBE	-	59=	
ALL	-	1000	
ALS1	-	400	
ALS2	-	400	
ALTO	-	700	
ALX	-	800	
AND	-	400	
AO	-	700	
AOEM	-	500	
ASE	-	1000	

I N D E X

SUBROUTINE AWESUB

PAGE 68

ASEA	-	1100																		
ASEB	-	1100																		
ASI	-	1000																		
AW	-	400																		
AWB	-	800	17=	21=	39=															
AWEA	-	1200	18=	25=	43=															
AWEB	-	1200	19=	23=	41=															
AWESUB	-	1*																		
BE	-	500	59	65	74	79	85	88	98											
BO	-	700																		
BTA0	-	700																		
B71M	-	300																		
B72M	-	300																		
B91M	-	300																		
B92M	-	300																		
CAE	-	600																		
CBE	-	600																		
CCCE	-	600																		
CCVE	-	600																		
CDCE	-	600																		
CDVE	-	600																		
CECE	-	600																		
CEVE	-	600																		
CO	-	700																		
COMP	-	8*																		
COMS	-	9*																		
COMT	-	10*																		
CONSTS	-	2*																		
COSGM1	-	700																		
COSGM2	-	700																		
COSTHR	-	700																		
DELM	-	1200	13	68	91															
DELL	-	800																		
DEI	-	500																		
DO	-	700																		
DVA	-	1200																		
DVB	-	1200																		
GNOT	-	200																		
HE	-	1000	17	22	26	40														
HEA	-	1200	18	27																
HEB	-	1200	19	28																
HEFC	-	61=	62	63	78															
HEIA	-	1200																		
HEIB	-	1200																		
HEU	-	600	64	86	87	98														
HER	-	600	54	62	64	96	97	98												
HESUB	-	16*																		
HE1	-	600	61	62																
HE2	-	600	65	73	78	79														
HSUBMD	-	13=	73	74	78	79	96	97												
HSUBMG	-	1100	13	22	40	68	69	74	79	91	92									
IEND	-	900																		
NEND	-	1100	67	90																
NSUBMG	-	1100	67	90																
PARMAB	-	11*																		

3-03

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I N D E X

SUBROUTINE AWESUB

PAGE 69

*	PARMAC	-	12*											
	P1	-	2CO	26	27	28	49	65	69	74	79	88	92	98
	P102	-	2CO											
	RA	-	10CO	15=	38=	39	41	43						
	RADIAN	-	2CO											
	RAMIN	-	8CO	29=	31=	32	33	46	54	56=	58=	60	61	62
		-	69	74	79	85	86	92	98					63
	RAU	-	10CO	14=	15	20	21	23	25	26	27	28	31	55
	RC	-	10CO	32	34	48	54	55	56					58
*	RETURN	-	104*											
	RE1	-	6CO	20	21	23	25	26	27	28	29	33	34	38
		-	48	49	61									46
	RE2	-	6CO	60	61	63	79							
	RF	-	4CO	14	59	64	69	85	87	92				
	RT	-	8CO											
	R011	-	3CO											
	R03	-	3CO											
	R05	-	3CO											
	R07	-	3CO											
	R09	-	3CO											
	R1	-	3CO											
	R2	-	4CO											
	R3	-	4CO											
	R4	-	4CO											
	R5	-	4CO											
	R6	-	4CO											
	R7	-	4CO											
	R8	-	4CO											
	R9	-	3CO											
*	SIN	-	3B											
	SINGM1	-	7CO											
	SINGM2	-	7CO											
	SINTHR	-	7CO											
*	SQRT	-	33	34	41	49	51	53	85					
	SUMUV	-	10CO	26=	54=	64=	89=							
	SUMDVA	-	11CO	27=	70=	75=	40=	83=	93=	99=	102=			
	SUMDVH	-	11CO	28=	71=	76=	81=	94=	100=					
	TANGM2	-	7CO											
	TANPH1	-	7CO											
	TAU	-	10CO	14	33	34	38	39	41	43	44			
	TAUEU	-	6CO											
	TAUE1	-	6CO											
	TAUM	-	3CO											
	TAUSQ	-	44=	45	47	49	50	52						
	TAUW	-	4CO	14										
	TEMP1	-	35=	36	37=	38	46=	47	50=	51=	53			
	TEMP2	-	48=	49	52=	53								
	TEMP4	-	64=	65	74	79								
	TEMP5	-	47=	49	53=	54	53=	65	87=	88	98			
	TEMP6	-	45=	49=	54	62=	65	86=						
	TEMP7	-	65=	66	71	76	81	83	88=	89	94	100	102	
	TEMP8	-	69=	70	71	74=	75	76	79=	80	81	92=	93	94
		-	99	100										98=
	TH1	-	3CO	21	23	25	39	41	43					
	TH2	-	3CO											

INDEX

SUBROUTINE AWESUH

PAGE 70

TH3	-	300
TH4	-	300
TPR	-	900
T10M	-	300
T12M	-	300
T2M	-	300
T4M	-	300
T5M	-	300
T6M	-	300
T7M	-	300
T9M	-	300
VCE	-	600
VFE0	-	600
W1	-	1000
* WORKA	-	4*
* WORKDE	-	5*
* WORKRE	-	6*
* WORK45	-	3*
WT	-	1000
XBARIM	-	1000
X0	-	700
* XOWORK	-	7*
XR	-	1000
X011	-	300
X03	-	300
X05	-	300
X07	-	300
X09	-	300
X1	-	700
X2	-	700
X3	-	700
X45	-	300
X76	-	300
Y0	-	700
Y011	-	300
Y03	-	300
Y05	-	300
Y07	-	300
Y09	-	300
Y1	-	700
Y2	-	700
Y3	-	700
Y45	-	300
Y76	-	300
Z41	-	97=
Z0	-	700
Z1	-	700
Z2	-	700
Z3	-	700

98

85=

86

88

96

D250-10020-4

3-70

I N D E X

SUBROUTINE BRAKSH

PAGE 71

```

1      SUBROUTINE BRAKSH                                66510
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66570
C      SUBROUTINE BRAKSH DETERMINES THE LENGTH OF THE DIAGONAL OF THE 66590
C      PARALLELOGRAM THAT IS FORMED BY THE INTERSECTION OF TWO PLANES IN 66600
C      THE BLOCK 1 ANALYSIS (SEE FIGURE 5.23) 66610
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66630
2      COMMON/WORKA/AINC,ANG,RF,TAUV,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALB,ALE,AW(5)
3      COMMON/XOAWOR/RAA,XRAYA,THRA,GAMA1A,GAMA2A,XOA,YOA,ZOA,X2A,Y2A,
1          Z2A,X1A,Y1A,Z1A,X3A,Y3A,Z3A,TANG2A,SINTRA,COSTRA,
2          TANPIA,AAAA,BA,CA,DA,BTAA,SINGA2,COSGA2,SINGA1,
3          COSGA1,ALTA
4      COMMON/XOBWOR/RAB,XRAYB,THRB,GAMA1B,GAMA2B,XOB,YOB,ZOB,X2B,Y2B,
1          Z2B,X1B,Y1B,Z1B,X3B,Y3B,Z3B,TANG2B,SINTRB,COSTRB,
2          TANPIB,ABBB,BB,CH,DR,BTARB,SINGB2,COSGB2,SINGB1,
3          COSGB1,ALTB
5      COMMON/CUMT/TAU,RC,SUMDV,XR,HE,AL(13),XHARH,ASF,AFF,WI,WT,RA,
1          RAO,ALI,ALJPP,AST
6      COMMON/PARML/HOLDR,AL3A,BRAK,AL11A,AS,RPX,ZPO,YPO,DS,KHRAK,KVSTR
7      COMMON/PARMO/ALP,KRASHB,CXNSRB,KGAM
8      GO TO (10,20,30),KBRAK
9      10  BRAK=SQRT((XOA-XOB)**2+(ZOA-ZOB)**2) 66650
10         GO TO 40 66660
11      20  BRAK=(ALP-HOLDR)*(R4+TAU)/R4 66670
12         GO TO 40 66680
13      30  BRAK=(ALP-HOLDR)*(R5+TAU)/R5 66690
14      40  RETURN 66700
15      END 66710

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I N D E X

SUBROUTINE BRASB

PAGE 72

SYMBOL	REFERENCES
10	8 9*
20	8 11*
30	8 13*
40	10 12 14*
AAAA	3C0
AB8	4C0
AFF	5C0
AINC	2C0
AJPP	5C0
AL	5C0
ALA	2C0
ALB	2C0
ALE	2C0
ALL	5C0
ALP	7C0 11 13
ALS1	2C0
ALS2	2C0
ALTA	3C0
ALT8	4C0
AL11A	6C0
AL3A	6C0
ANU	2C0
AS	6C0
ASE	5C0
AS1	5C0
AW	2C0
BA	3C0
BB	4C0
BRAS	6C0 9= 11= 13=
BRASB	1*
BTADA	3C0
BTAD8	4C0
CA	3C0
CB	4C0
COM1	5*
COSGA1	3C0
COSGA2	3C0
COSGB1	4C0
COSGB2	4C0
COSTKA	3C0
COSTKB	4C0
DA	3C0
DB	4C0
DS	6C0
GAMA1A	3C0
GAMA1B	4C0
GAMA2A	3C0
GAMA2B	4C0
HE	5C0
HOLDR	6C0 11 13
KBRAS	6C0 11
KGAM	7C0
KRASBB	7C0

I N D E X

SUBROUTINE BRAKSB

PAGE 77

	KVSTR	-	6C0		
	KXRSBB	-	7C0		
*	PARML	-	6*		
*	PARMO	-	7*		
	RA	-	5C0		
	RAA	-	3C0		
	RAB	-	4C0		
	RAD	-	5C0		
	RC	-	5C0		
*	RETURN	-	14*		
	RF	-	2C0		
	RPX	-	6C0		
	R2	-	2C0		
	R3	-	2C0		
	R4	-	2C0	11	
	R5	-	2C0	13	
	R6	-	2C0		
	R7	-	2C0		
	RA	-	2C0		
	SINGA1	-	3C0		
	SINGA2	-	3C0		
	SINGB1	-	4C0		
	SINGB2	-	4C0		
	SINTRA	-	3C0		
	SINTRB	-	4C0		
*	SQRT	-	9		
	SUMDV	-	5C0		
	TANG2A	-	3C0		
	TANG2B	-	4C0		
	TANP1A	-	3C0		
	TANP1B	-	4C0		
	TQU	-	5C0	11	13
	TQUW	-	2C0		
	THRA	-	3C0		
	THRB	-	4C0		
	WI	-	5C0		
*	WORKA	-	2*		
	WT	-	5C0		
	XBARIM	-	5C0		
	XDA	-	3C0	9	
*	XDAWOR	-	3*		
	XDB	-	4C0	9	
*	XDBWOR	-	4*		
	XR	-	5C0		
	XRATA	-	3C0		
	XRATH	-	4C0		
	X1A	-	3C0		
	X1B	-	4C0		
	X2A	-	3C0		
	X2B	-	4C0		
	X3A	-	3C0		
	X3B	-	4C0		
	YOA	-	3C0		
	YOB	-	4C0		
	YPO	-	6C0		

I N D E X

SUBROUTINE BRAKSB

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Y1A - 3C0
Y1B - 4C0
Y2A - 3C0
Y2B - 4C0
Y3A - 3C0
Y3B - 4C0
Z0A - 3C0
Z0B - 4C0
ZP0 - 6C0
Z1A - 3C0
Z1B - 4C0
Z2A - 3C0
Z2B - 4C0
Z3A - 3C0
Z3B - 4C0

9
9

```

1      SUBROUTINE BSUBC                                     66730
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66800
C      SUBROUTINE BSUBC SFTS UP THE CORRECT VARIABLES AND EQUATIONS TO 66820
C      DETERMINE THE COORDINATES (X, Y, AND Z) OF THE POINTS POB, PIH, 66830
C      AND P3H ON THE PSEUDOELLIPSOID FOR THE BLOCK 1 ANALYSIS IN 66840
C      SUBROUTINE SCI (SECTION 5.2.1.1.1). 66850
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 66870
2      COMMON/XUBWOR/RAB,XRATB,THRB,GAMA1B,GAMA2B,XDH,YDH,ZDH,X2B,Y2B,
1          Z2B,X1B,Y1B,Z1B,X3B,Y3B,Z3B,TANG2B,SINTRB,COSTRB,
2          TANP1B,ABB,BH,CH,DH,BTAOB,SINGB2,COSGB2,SINGB1,
3          COSGB1,ALTB
3      COMMON/XOWORK/XD,YD,ZD,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTHR,
1          COSTHR,TANPH1,AO,BO,CO,DO,BTAO,SINGM2,COSGM2,
2          SINGM1,COSGM1,ALTO
4      COMMON/PARMH/RAT,XRAT,THR,GAMA1,GAMA2,ZIAT
5      COMMON/PARMS/ICHN
6      CALL RASUBB                                           66890
7      RAB=RAT                                               66900
8      CALL XRSUBH                                           66910
9      XRATB=XRAT                                           66920
10     CALL THETAR(RAT,XRAT,THR)                             66930
11     THRB=THR                                              66940
12     CALL GAMSUBH                                           66950
13     GAMA1B=GAMA1                                           66960
14     CALL GAMA2S                                           66970
15     GAMA2B=GAMA2                                           66980
16     IF (ICHN.EQ.5) GO TO 10                               66990
17     CALL POSUB                                             67000
18     CALL PISUB                                             67010
19     CALL P3SUB                                             67020
20     IZZ = 3H                                              67030
21     CALL TRAN(XD,XOB,IZZ)                                   67040
22     10 RETURN                                             67050
23     END

```

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I N D E X

SUBROUTINE BSUBC

PAGE 76

SYMBOL	-----	REFERENCES	-----
IO	- 16	22*	
ABB	- 2CO		
ALTB	- 2CO		
ALTO	- 3CO		
AO	- 3CO		
BB	- 2CO		
BO	- 3CO		
* BSUBC	- 1*		
BTAD	- 3CO		
BTADB	- 2CO		
CB	- 2CO		
CO	- 3CO		
COSOB1	- 2CO		
COSOB2	- 2CO		
COSOM1	- 3CO		
COSOM2	- 3CO		
COSOP	- 3CO		
COSTRB	- 2CO		
OB	- 2CO		
JO	- 3CO		
GAMA1	- 4CO	13	
GAMA1B	- 2CO	13=	
GAMA2	- 4CO	15	
GAMA2B	- 2CO	15=	
* GAMA2S	- 14*		
* GAMSUB	- 12*		
ICHN	- 5CO	16	
IZZ	- 20=	21AG	
* PARMM	- 4*		
* PARMS	- 5*		
* POSUB	- 17*		
* PLSUB	- 18*		
* PJSUB	- 19*		
RAB	- 2CO	7=	
* RASUBR	- 6*		
RAT	- 4CO	7	10AG
* RETURN	- 22*		
SINGB1	- 2CO		
SINGB2	- 2CO		
SINGN1	- 3CO		
SINGM2	- 3CO		
SINTHR	- 3CO		
SINTRB	- 2CO		
TANGM2	- 3CO		
TANG2B	- 2CO		
TANPH1	- 3CO		
TANP1B	- 2CO		
* THEJAR	- 10*		
THR	- 4CO	10AG	11
THRB	- 2CO	11=	
* TRAN	- 21*		
XO	- 3CO	21AG	
XOB	- 2CO	21AG	

I N D E X

SUBROUTINE BSUBC

PAGE 77

* XOHWOR	-	2*	
* XOWORK	-	3*	
XRAI	-	4C0	9 10AG
XRAIB	-	2C0	9=.
* XRSUBH	-	8*	
X1	-	3C0	
X1b	-	2C0	
X2	-	3C0	
X2B	-	2C0	
X3	-	3C0	
X3B	-	2C0	
Y0	-	3C0	
Y0B	-	2C0	
Y1	-	3C0	
Y1B	-	2C0	
Y2	-	3C0	
Y2B	-	2C0	
Y3	-	3C0	
Y3B	-	2C0	
Z0	-	3C0	
Z0B	-	2C0	
Z1	-	3C0	
Z1A1	-	4C0	
Z1B	-	2C0	
Z2	-	3C0	
Z2B	-	2C0	
Z3	-	3C0	
Z3B	-	2C0	

88570
88660
88680
88690
88700
88720

88740

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88900
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88940
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88960
88970
88980
89010
89020
89030
89040
89050

89000

89070
89080
89090
89100
89110
89120
89130
89140
89150

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I N D E X

SUBROUTINE CONV

PAGE 79

44		WD=(WDOT-WDB)/DIFAB	89160
45		DEED=(DIS-DISB)/DIFAB	89170
46	160	IF (DEED-WD) 200,170,200	89180
47	170	CONTINUE	89190
48		IF (WDOT-DIS) 180,180,190	89200
49	180	CONTINUE	89210
50		PCTAB=PCTAB*.001	89220
51		GO TO 210	89230
52	190	PCTAB=PCTAB*.999	89240
53		GO TO 210	89250
54	200	DIFAB=(WDOT-DIS)/(DEED-WD)	89260
55		WDB=WDOT	89270
56		DISB=DIS	89280
57		PCTAB=PCTAB*DIFAB	89290
58	210	IF (KDUMP(6)) 270,270,220	89300
59	220	CONTINUE	89310
60		WRITE(6,230) PCTAB,DIFAB,WDOT,DIS,WD,DEED	89320
61	230	FORMAT(7H PCTAB=1PE11.4,2X,6H DIFAB=1PE11.4,2X,5H WDOT=1PE11.4,2X,4H XDIS=1PE11.4,2X,3H WD=1PE11.4,2X,5H DEED=1PE11.4)	89330
62	270	CONTINUE	89340
63		TIMECK1=TIME	89420
64		RETURN	89430
65		END	89440

SYMBOL	-----	REFERENCES	-----
10	-	12	13*
40	-	15	16*
50	-	15	19*
60	-	19	20*
70	-	21	22*
80	-	21	25*
90	-	19	27*
100	-	29	30*
110	-	24	26
120	-	35	36*
130	-	37WR	38*
140	-	12	40*
150	-	42	43*
160	-	42	46*
170	-	46	47*
180	-	48	49*
190	-	48	52*
200	-	46	54*
210	-	51	53
220	-	58	59*
230	-	60WR	61*
270	-	35	39
AINCW	-	900	58
AKG	-	300	62*
AKGY	-	900	
AKR	-	300	31=
AKRH	-	200	32=
AKRHLD	-	600	13
AKRN	-	200	14=
AKRST	-	900	13
AKRTAU	-	400	14
AKSLOT	-	300	23=
AKU	-	300	25=
ALAMN	-	700	28=
AMPN	-	900	31
AMW	-	900	32
AP	-	800	37WR
AT	-	900	
BRNOUT	-	800	
CFC	-	700	
CFO	-	1000	
CFOL	-	1000	
CLOPS	-	1000	15
VCODE1	-	700	42
CONV	-	1*	
DEED	-	1000	18=
DELF	-	500	19
DELLP	-	700	27
DELTA	-	900	37WR
DELZ	-	500	45=
UIFAB	-	40=	46
UIFAKR	-	13=	54
UIS	-	900	60WR
		18	21
		17	27
		18	28
		21	34
		44	57
		45	60WR
		48	37WR
		45	45
		48	48
		54	54
		56	56
		60WR	60WR

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SUBROUTINE CONV

PAGE 81

	DISB	-	7C0	18	34=	45	56=	
*	DUMYG	-	5*					
*	DUMYQ	-	7*					
	EPS	-	7C0					
	EP1	-	10C0					
	F	-	10C0					
	FX	-	7C0					
	HCO	-	5C0					
	ICHN	-	11C0					
	III	-	8C0					
	IJJ	-	8C0					
	IIS	-	8C0					
*	INPUTD	-	2*					
*	INPUTE	-	3*					
*	INPUTF	-	4*					
*	INPUTJ	-	5*					
	IS1	-	8C0					
	IS2	-	8C0					
	KDUMP	-	5C0	35	58			
	NAKEND	-	3C0					
	NAKR	-	3C0					
	NAKRST	-	4C0	12				
	NI	-	8C0					
	NINCPL	-	8C0					
	NPH	-	4C0					
	NSLOT	-	8C0					
	NTABE	-	8C0					
	NTAUTO	-	4C0					
	NTME	-	8C0					
	P	-	9C0					
	PA	-	5C0					
*	PARMB	-	8*					
*	PARMF	-	9*					
*	PARMK	-	10*					
*	PARMS	-	11*					
	PCTAB	-	4C0	40	41	50=	52=	57=
	PCTABX	-	6C0	40	41=			60WR
	PEPU	-	10C0					
	PH	-	9C0					
	PHI	-	5C0					
	PHMAX	-	7C0					
	PHOLD	-	7C0					
	PHST	-	4C0					
	PHX	-	7C0					
	PMAX	-	8C0					
	PMIN	-	8C0					
	PON	-	9C0					
	PONX	-	7C0					
	PSOPO	-	7C0					
	RBFLAG	-	2C0	29				
*	RETURN	-	64*					
	SCUR	-	8C0					
	SWOOTN	-	10C0					
	T	-	9C0					
	TAUAKR	-	4C0					

I N D E X		SUBROUTINE CONV										PAGE	82
TAUTO	-	8C0											
TBLAKR	-	3C0											
TIMAKR	-	3C0											
TIMCKI	-	6C0	63=										
TIME	-	9C0	63										
TIMEPH	-	4C0											
TOFLAG	-	8C0											
TSS	-	7C0											
TX	-	7C0											
U	-	9C0											
VFWEB	-	10C0											
WD	-	10C0	17=	19	27	37WR	44=	46	54	60WR			
WDR	-	7C0	17	33=	44	55=							
WOUT	-	8C0	17	21	27	37	37WR	44	48	54	56	60WR	
WOUTD	-	8C0											
WOUTX	-	7C0											
WGTOT	-	10C0											

```

1      SUBROUTINE DPRASB                                     67070
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 67140
C      SUBROUTINE DPRASB DETERMINES THE DISTANCE BETWEEN THE POINTS PRA 67160
C      AND PRA', PSA AND PSA', PRH AND PRH', AND PSB AND PSB' THAT LIE ON 67170
C      THE PLANES PRODUCED IN SECTORS 3A AND 3B OR 11A AND 11B IN THE 67180
C      BLOCK 1 ANALYSIS OF SUBROUTINE SCI (SECTION 5.2.1.1.2). 67190
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 67210
2      COMMON/XOAPW/RAAP,XRATAP,THRAP,GAM1AP,GAM2AP,XOAP,YOAP,ZOAP,
1          X2AP,Y2AP,Z2AP,X1AP,Y1AP,Z1AP,OAP(3),TG2AP,STRAP,
2          CTRAP,AAP,BAP,CAP,DAP,BTAUAP,SOAP(4),ALTAP
3      COMMON/XOAPW/RABP,XRATBP,THRBP,GAM1BP,GAM2BP,XOBP,YOBP,ZOBP,
1          X2BP,Y2BP,Z2BP,X1BP,Y1BP,Z1BP,OBP(3),TG2BP,STRBP,
2          CTRBP,TP1BP,AHP,BHP,CBP,DHP,BTAOBP,SOBP(4),ALTRP
4      COMMON/XUAWOR/RAA,XHATA,THRA,GAMA1A,GAMA2A,XOA,YOA,ZOA,X2A,Y2A,
1          Z2A,X1A,Y1A,Z1A,XJA,YJA,ZJA,TANG2A,SINTRA,COSTRA,
2          TANP1A,AAA,HA,CA,DA,BTAOA,SINGA2,COSGA2,SINGA1,
3          COSGA1,ALTA
5      COMMON/XOAPW/RAB,XRATB,THRB,GAMA1B,GAMA2B,XOB,YOB,ZOB,X2B,Y2B,
1          Z2B,X1B,Y1B,Z1B,XJB,YJB,ZJB,TANG2B,SINTRB,COSTRB,
2          TANP1B,ABB,BB,CB,DB,BTAOB,SINGB2,COSGB2,SINGB1,
3          COSGB1,ALTB
6      COMMON/PARMN/DPR4,DPSA
7      DPR4=SQRT((XOB-XOBP)**2+(YOB-YOBP)**2+(ZOA-ZOAP)**2) 67230
8      DPSA=DPR4 67240
9      RETURN 67250
10     END

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SYMBOL	-----	REFERENCES	-----
AAAA	-	4C0	
AAP	-	2C0	
ABB	-	5C0	
ABP	-	3C0	
ALTA	-	4C0	
ALTAP	-	2C0	
ALTB	-	5C0	
ALTBP	-	3C0	
BA	-	4C0	
BAP	-	2C0	
BB	-	5C0	
BBP	-	3C0	
BTA0A	-	4C0	
BTA0AP	-	2C0	
BTA0B	-	5C0	
BTA0BP	-	3C0	
CA	-	4C0	
CAP	-	2C0	
CB	-	5C0	
CBP	-	3C0	
COSGA1	-	4C0	
COSGA2	-	4C0	
COSGB1	-	5C0	
COSGB2	-	5C0	
COSTRA	-	4C0	
COSTRB	-	5C0	
CTRAP	-	2C0	
CTRBP	-	3C0	
DA	-	4C0	
DAP	-	2C0	
DB	-	5C0	
DBP	-	3C0	
DPRA	-	6C0	7= 8
* DPRASH	-	1*	
UPSA	-	6C0	8=
GAMA1A	-	4C0	
GAMA1B	-	5C0	
GAMA2A	-	4C0	
GAMA2B	-	5C0	
GAM1AP	-	2C0	
GAM1BP	-	3C0	
GAM2AP	-	2C0	
GAM2BP	-	3C0	
OAP	-	2C0	
OBP	-	3C0	
* PARMN	-	6*	
RAA	-	4C0	
RAAP	-	2C0	
RAB	-	5C0	
RABP	-	3C0	
* RETURN	-	9*	
SINGA1	-	4C0	
SINGA2	-	4C0	

I N D E X

SUBROUTINE DPRASB

PAGE 85

	SINGB1	-	500	
	SINGB2	-	500	
	SINTRA	-	400	
	SINTRB	-	500	
	SOAP	-	200	
	SOBP	-	300	
B	SORT	-	7	
	STRAP	-	200	
	STRBP	-	300	
	TANG2A	-	400	
	TANG2B	-	500	
	TANP1A	-	400	
	TANP1B	-	500	
	TG2AP	-	200	
	TG2BP	-	300	
	THRA	-	400	
	THRAP	-	200	
	THRB	-	500	
	THRBP	-	300	
	TP1BP	-	300	
	XOA	-	400	
	XOAP	-	200	
B	XOAPW	-	2*	
B	XUAWOR	-	4*	
	XOB	-	500	7
	XOBP	-	300	7
B	XOBPW	-	3*	
B	XOBWOR	-	5*	
	XRA1A	-	400	
	XRA1AP	-	200	
	XRA1B	-	500	
	XRA1BP	-	300	
	X1A	-	400	
	X1AP	-	200	
	X1B	-	500	
	X1BP	-	300	
	X2A	-	400	
	X2AP	-	200	
	X2B	-	500	
	X2BP	-	300	
	X3A	-	400	
	X3B	-	500	
	YOA	-	400	
	YOAP	-	200	
	YOB	-	500	7
	YOBP	-	300	7
	Y1A	-	400	
	Y1AP	-	200	
	Y1B	-	500	
	Y1BP	-	300	
	Y2A	-	400	
	Y2AP	-	200	
	Y2B	-	500	
	Y2BP	-	300	
	Y3A	-	400	

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SUBROUTINE DPRASB

PAGE 55

Y3B - 500
Z0A - 400
Z0AP - 200
Z0B - 500
Z0BP - 300
Z1A - 400
Z1AP - 200
Z1B - 500
Z1BP - 300
Z2A - 400
Z2AP - 200
Z2B - 500
Z2BP - 300
Z3A - 400
Z3B - 500

7
7

1. The first group of people who are not in the labor force are those who are not in the labor force because they are not in the labor force.

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I N D E X

SUBROUTINE ENDCSH(ITER)

41	HE1=0	63115
42	GO TO 150	63116
43	140 ALFE=ALFEM	63117
44	RE2=COS(ALFE)*RF*BE/SURT(COS(ALFE)**2*HE**2-COS(ALFE)**2*1.0)	63118
45	HE1=(RE2-RE1)/SIV(ALFE)*COS(ALFE)	63119
46	150 HE2=SQRT(RF**2-RE2**2)/BE	63120
47	HE0=HE1+HE2	63121
48	IF(NEND.EQ.2 .AND.DELH.GT.0.0) GO TO 175	63122
49	IF(HE0-TAUM)170,160,160	63123
50	160 HER=HE0	63124
51	GO TO 180	63125
52	170 HER=TAUM	63126
53	GO TO 180	63127
54	175 HER=HE0+DELH	63128
55	180 DELL=DLRF*RF	63129
56	DELL0=0.0	63130
57	DELLR=0.0	63131
58	TAUE1=SQRT((RE2-RE1)**2+HE1**2)	63132
59	TAUE0=SQRT((RF-RE1)**2+HE0**2)	63133
60	190 ALITHE=RF/BE	63134
61	TAU=0	63135
62	CALL LPDAPS	63136
63	TEMP1 = ((RE2*RE1+RE1**2+HE2**2)/3.0)*HE1*PI	63137
64	TEMP2 = ((ALITHE**2*3.0-HE2**2)/3.0)*HE2*BE**2*PI	63138
65	VCE = (HER-HE0)*RF**2*PI +TEMP2+TEMP1	63139
66	IF(NSUBMG.EQ.0 .OR. NEND.EQ.1) GO TO 196	63140
67	IF(HSUBMG.GT.DELH) GO TO 192	63141
68	VCNA = HSUBMG*PI*RF**2	63142
69	VCNB = VCE - VCNA	63143
70	GO TO 196	63144
71	192 IF(HSUBMG.GT.(DELH+HE2)) GO TO 194	63145
72	VCNA=DELH*PI*RF**2+((ALITHE**2*3.0-(HSUBMG-DELH)**2)/3.0)*	63146
73	\$(HSUBMG-DELH)*BE**2*PI	63147
74	VCNB=VCE-VCNA	63148
75	GO TO 196	63149
76	194 VCNA=DELH*PI*RF**2 + TEMP2+((RE2*RE1+RE1**2+RE2**2)/3.0)*	63150
77	\$(HSUBMG-DELH-HE2)*PI	63151
78	VCNB=VCE-VCNA	63152
79	196 TEM3=BE**2	63153
80	TEM1=TEM3-1.0	63154
81	CBF=TEM1**2	63155
82	CBF=-TEM1*TEM3*RE1*4.0	63156
83	TEM2=RF**2	63157
84	TEM4=TEM2*TEM1	63158
85	TEM4=(TEM3**2+TEM3)*HE0**2+TEM4	63159
86	TEM5=RE1**2	63160
87	TEM4=TEM4-TEM5*TEM3	63161
88	CCCE=(TEM3**2+TEM3*3.0+TEM4)*2.0	63162
89	CCVE=(TEM3**2+TEM3)*2.0	63163
90	TEM4=TEM2*TEM3	63164
91	CDCE=((HE0**2+TEM3)*TEM3**2+TEM4)*RE1*4.0	63165
92	CDVE=4.0*RE1*TEM3**2	63166
93	TEM4=TEM2**2+(TEM3-HE0**2)*TEM3*TEM2*2.0	63167
94	CECE=TEM4+(TEM3+HE0**2)**2*TEM3**2	63168
95	CEVE=(HE0**2+TEM3+TEM3*TEM3+TEM2)*TEM3*2.0	63169

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I N D E X

SUBROUTINE ENDCSB(IER)

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94		CALL ASESUB	63500
95		VFFO=SUMDV	63510
96		WRITE(6,200)	63520
97	200	FORMAT(5H RE1,12X,5HALFEM,10X,4HALFE,11X,3HRE2,12X,3HHE1,12X,	63530
		X3HHE2,12X,3HHEO,11X,3HHER)	63540
98		WRITE(6,210)RE1,ALFEM,ALFE,RE2,HE1,HE2,HEO,HER	63550
99		WRITE(6,220)	63560
100	220	FORMAT(6H VFE0,11X,3HVCE,12X,5HTAUED,10X,5HTAUFI,10X,3HCAF,	63570
		A1PX,3HCHHE,12X,4HCCCE,10X,4HCCVF)	63580
101		WRITE(6,210)VFE0,VCF,TAJEO,TAUL1,CAF,CHF,CCCE,CCVE	63590
102		WRITE(6,230)	63600
103	230	FORMAT(6H CCE,11X,4HCDVE,11X,4HCECE,11X,4HCEVE)	63610
104		WRITE(6,240)CCE,CDVE,CECE,CEVE	63620
105	240	FORMAT(1X,4(1PE15.7),/)	63630
106	210	FORMAT(1X,7(1PE15.7),1PE14.7)	63640
107		RETURN	63650
108		END	

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SYMBOL	REFERENCES
10 - 18WR 19*	
20 - 20WR 21*	
30 - 24 25*	
40 - 25WR 26*	
50 - 24 24*	
60 - 28 29*	
70 - 29WR 30*	
80 - 28 32*	
90 - 32 33*	
100 - 33 34*	
110 - 34WR 35*	
120 - 32 33 37*	
130 - 38 39*	
140 - 38 43*	
150 - 42 46*	
160 - 49 50*	
170 - 49 52*	
175 - 48 54*	
180 - 51 53 55*	
190 - 60*	
192 - 67 71*	
194 - 71 75*	
196 - 66 70 74 77*	
200 - 95WR 97*	
210 - 98WR 101WR 106*	
220 - 99WR 100*	
230 - 102WR 103*	
240 - 104WR 105*	
A - 4CO	
ABS - 33	
ACOS - THE VARIABLE ACOS - IS USED BEFORE IT IS DEFINED	
ACOS - 37	
AEEA - 15CO	
AEEB - 15CO	
AER - 37= 38 39	
AFF - 12CO	
AINC - 5CO	
AJPP - 12CO	
AK - 3CO	
AKK - 3CO	
AKHADJ - 11CO	
AL - 12CO	
ALA - 5CO	
ALAMDA - 8CO	
ALAMIN - 8CO	
ALB - 5CO	
ALC - 4CO	
ALD - 4CO	
ALE - 5CO	
ALFE - 7CO 39= 43= 44 45 98WR	
ALFEM - 7CO 22= 24 38 43 98WR	
ALITHE - 60= 64 72	
ALL - 12CO	

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I N D E X

SUBROUTINE ENDCSB(IE2)

PAGE 92

HEK	700	50=	52=	54=	65	98WR								
HE1	700	41=	45=	47	58	63	98WR							
HE2	700	46=	47	64	71	75	98WR							
HSUBMG	1400	67	68	71	72	75								
IEND	1100													
IER	1AG	17=	27=	31=	36=									
III	1300													
IIJ	1300													
IIIS	1300													
INPUTC	3*													
ISI	1300													
IS2	1300													
LPDAPS	62*													
NEND	1400	48	66											
NI	1300													
NINCPL	1300													
NSLOT	1300													
NSUBMG	1400	66												
NTABE	1300													
NTME	1300													
PARMAH	14*													
PARMAC	15*													
PARMAI	16*													
PARMH	13*													
PI	200	63	64	65	68	72	75							
PI02	200													
PMAA	1300													
PMIN	1300													
RA	1200													
RAUJAN	200	22												
RAMIN	500													
RAO	1200													
RC	1200													
RETURN	107*													
RE1	700	23=	28	37	40	45	58	59	63	75	80	84	89	
	90	98WR												
RE2	700	40=	44=	45	46	58	63	75	98WR					
RF	500	28	37	44	46	55	59	60	65	68	72	75	81	
RP2	1000													
RT	800													
R011	400													
R03	400													
R05	400													
R07	400													
R09	400													
R1	400													
R2	500													
R3	500													
R4	500													
R5	500													
R6	500													
R7	500													
R8	500													
R9	400													
SCUR	1300													

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SUBROUTINE EMDCSH(1ER)

PAGE 04

X76	-	4C0
Y011	-	4C0
Y03	-	4C0
Y05	-	4C0
Y07	-	4C0
Y09	-	4C0
Y45	-	4C0
Y76	-	4C0

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50      GO TO 100
51      90      Z11=SQRT(Z11-TEMP1)
52      100     TEMP2 = Z22 - TEMP1
53      IF (TEMP2) 110,120,120
54      110     Z2AA=SQRT(-TEMP2)
55      Z22=0.
56      GO TO 130
57      120     Z22=SQRT(TEMP2)
58      130     TEMP2=Z33-TEMP1
59      IF (TEMP2) 140,150,150
60      140     Z3AA=SQRT(-TEMP2)
61      Z33=0.
62      GO TO 280
63      150     Z33=SQRT(TEMP2)
64      GO TO 280
65      160     TEMP1=-BBIG/2.
66      TEMP2=TEMP1+SQRT(AKEEP)
67      IF (TEMP2) 170,180,190
68      170     ASUBH=-(ABS(TEMP2)**(1./J.))
69      GO TO 200
70      180     ASUBH=0.
71      GO TO 200
72      190     ASUBH=TEMP2**(1./J.)
73      200     TEMP2=TEMP1-SQRT(AKEEP)
74      IF (TEMP2) 210,220,230
75      210     BSUBH=-((-TEMP2)**(1./J.))
76      GO TO 240
77      220     BSUBH=0.
78      GO TO 240
79      230     BSUBH=TEMP2**(1./J.)
80      240     Z11=BSUBH*ASUBH
81      Z22=-Z11/2.
82      Z33=Z22
83      Z2AA=((ASUBH-BSUBH)/2.)*SQRT(3.)
84      Z3AA=-Z2AA
85      TEMP1=PBIG/3.
86      ALLIT=Z11-TEMP1
87      Z11=ALLIT
88      Z22=Z22-TEMP1
89      ANLIT=Z22
90      ANLIT=Z33-TEMP1
91      Z33=ANLIT
92      IF (ALLIT) 260,250,250
93      250     Z11=SQRT(ALLIT)
94      GO TO 270
95      260     Z1AA=SQRT(-ALLIT)
96      Z11=0.
97      270     TEMP1=SQRT(Z2AA**2+Z22**2)
98      XSQR=SQRT((TEMP1+Z22)/2.)
99      YSQR=SQRT((TEMP1-Z22)/2.)
100     Z2AA=YSQR
101     Z22=XSQR
102     TEMP1=SQRT(Z3AA**2+Z33**2)
103     XSQR=SQRT((TEMP1+Z33)/2.)
104     YSQR=SQRT((TEMP1-Z33)/2.)

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54150
54160
54170
54180
54190
54200
54210
54220
54230
54240
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54280
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105		Z3AA=-YSORI	54700
106		Z33=XSORI	54710
107	280	IF (H) 300,290,290	54720
108	290	RR1=-Z11-Z22-Z33	54730
109		ARI1=-Z1AA-Z2AA-Z3AA	54740
110		RR2=-Z11+Z22+Z33	54750
111		ARI2=-Z1AA+Z2AA+Z3AA	54760
112		RR3=Z11-Z22+Z33	54770
113		ARI3=Z1AA-Z2AA+Z3AA	54780
114		RR4=Z11+Z22-Z33	54790
115		ARI4=Z1AA+Z2AA-Z3AA	54800
116		GO TO 310	54810
117	300	RR1=Z11+Z22+Z33	54820
118		ARI1=Z1AA+Z2AA+Z3AA	54830
119		RR2=Z11-Z22-Z33	54840
120		ARI2=Z1AA-Z2AA-Z3AA	54850
121		RR3=-Z11+Z22-Z33	54860
122		ARI3=-Z1AA+Z2AA-Z3AA	54870
123		RR4=-Z11-Z22+Z33	54880
124		ARI4=-Z1AA-Z2AA+Z3AA	54890
125	310	IF (RR1) 320,340,320	54900
126	320	IF (ABS (ARI1) /ABS (RR1) -0.02) 330,340,340	54910
127	330	ROOT1=RR1	54920
128		GO TO 350	54930
129	340	ROOT1=-9.9999999E+35	54940
130	350	IF (RR2) 360,380,360	54950
131	360	IF (ABS (ARI2) /ABS (RR2) -0.02) 370,380,380	54960
132	370	ROOT2=RR2	54970
133		GO TO 390	54980
134	380	ROOT2=-9.9999999E+35	54990
135	390	IF (RR3) 400,420,400	55000
136	400	IF (ABS (ARI3) /ABS (RR3) -0.02) 410,420,420	55010
137	410	ROOT3=RR3	55020
138		GO TO 430	55030
139	420	ROOT3=-9.9999999E+35	55040
140	430	IF (RR4) 440,460,440	55050
141	440	IF (ABS (ARI4) /ABS (RR4) -0.02) 450,460,460	55060
142	450	ROOT4=RR4	55070
143		GO TO 470	55080
144	460	ROOT4=-9.9999999E+35	55090
145	470	IF (ROOT1-ROOT2) 540,480,480	55100
146	480	IF (ROOT1-ROOT3) 520,490,490	55110
147	490	IF (ROOT1-ROOT4) 510,500,500	55120
148	500	ROOTM = ROOT1	55130
149		GO TO 570	55140
150	510	ROOTM = ROOT4	55150
151		GO TO 570	55160
152	520	IF (ROOT3-ROOT4) 510,530,530	55170
153	530	ROOTM = ROOT3	55180
154		GO TO 570	55190
155	540	IF (ROOT2-ROOT3) 520,550,550	55200
156	550	IF (ROOT2-ROOT4) 510,560,560	55210
157	560	ROOTM = ROOT2	55220
158	570	X = ROOTM * P/4.	55230
159		RETURN	55240

I N D E X.

160

END

SUBROUTINE FUGRE (P,Q,R,S,X)

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PAGE 99

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C-6

I N D E X			SUBROUTINE FDGRE (P,Q,R,S,X)														PAGE 101
X	-	1AG	158=														
XSQR	-	98=	101														
XSQR1	-	103=	106														
YSQR	-	99=	100														
YSQR1	-	104=	105														
Z1AA	-	3=	48=	95=	109	111	113	115	118	120	122	124					
Z11	-	2=	33=	39=	43=	47	48	49=	51=	80=	81	86	87=	93=			
		96=	108	110	112	114	117	119	121	123							
Z2AA	-	5=	54=	83=	84	97	100=	109	111	113	115	118	120	122			
		124=															
Z22	-	4=	34=	40=	41	44=	45	52	55=	57=	61=	62	88=	89			
		97	98	99	101=	108	110	112	114	117	119	121	123				
Z3AA	-	7=	60=	84=	102	105=	109	111	113	115	118	120	122	124			
Z3J	-	6=	35=	41=	45=	58	61=	63=	82=	90	91=	102	103	104			
		106=	108	110	112	114	117	119	121	123							

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SYMBOL	-----	REFERENCES	-----
10	- 13 14*		
20	- 14WR 15*		
30	- 13 17*		
AANN	- 5C0		
THE VARIABLE- ACOS -IS USED BEFORE IT IS DEFINED			
ACOS	- 12		
AIG	- 5C0		
AINC	- 4C0		
ALA	- 4C0		
ALB	- 4C0		
ALE	- 4C0		
ALITTL	- 5C0		
ALS1	- 4C0		
ALS2	- 4C0		
AND	- 4C0		
AOE	- 5C0 8= 10 12		
AOHM	- 3C0		
ARCO	- 5C0		
ARC1	- 5C0		
AS11	- 5C0		
AW	- 4C0		
A1E	- 5C0 9=		
BH	- 3C0 11		
BOE	- 5C0 10= 13		
BTADP	- 3C0 10 12		
BX	- 5C0		
B1E	- 5C0 11= 13		
* CONSTS	- 2*		
DELLRI	- 5C0		
DH1	- 3C0		
GAMA1	- 6C0		
GAMA2	- 6C0 12=		
* GAMA2S	- 1*		
GNOT	- 2C0		
HHR	- 3C0		
ICHN	- 7C0 16=		
* INPUTA	- 3*		
* PARMH	- 5*		
* PARMM	- 6*		
* PARMS	- 7*		
PI	- 2C0		
PI02	- 2C0 12		
RADIAN	- 2C0		
RAT	- 6C0 12		
* RETURN	- 17*		
RF	- 4C0 8 9 11		
R16	- 3C0		
ROE1	- 5C0		
ROPE4	- 5C0		
RXX	- 5C0		
R2	- 4C0		
R3	- 4C0		
R4	- 4C0		

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SUBROUTINE GAMAZS

PAGE 104

	H5	"	4C0	
	H6	"	4C0	
	H7	"	4C0	
	H8	"	4C0	
"	SOBT	"	12	
	TAUW	"	4C0	"
	THR	"	6C0	
	THR1	"	5C0	
	THRO	"	5C0	
"	WORKA	"	4"	
	XRA1	"	6C0	
	YPI	"	5C0	
	Z1	"	5C0	
	ZPI	"	5C0	
	ZLAT	"	6C0	

1		SUBROUTINE GAMSUB	67540
C		CC	67610
C		SUBROUTINE GAMSUB DETERMINES THE ANGLE GAMA1 BETWEEN A LINE NORMAL	67630
C		TO THE PERIMETER IN THE X-Z PLANE, AND A LINE NORMAL TO THE LINE	67640
C		SEGMENT THAT WHICH IS A RADIAL VECTOR FROM THE MOTOR AXIS TO A	67650
C		POINT ON A SECTOR PERIMETER (SECTION 5.2.1.1.1).	67660
C		CC	67680
2		COMMON/CONSTS/GNOT,P1,PI02,RADIAN	
3		COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4H,T5M,X45,Y45,ALC,X03,Y03,	
	1	R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,	
	2	ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,	
	3	TH3,TH4,B71M,B72M,B91M,B92M	
4		COMMON/WORKA/AINC,ANO,RF,TAUH,R2,R3,R4,R5,R6,R7,R8,	
	1	ALS1,ALS2,ALA,ALB,ALE,AW(5)	
5		COMMON/PARMH/RAT,XRAT,THR,GAMA1,GAMAZ,ZIAT	
6		COMMON/PARMO/ALP,KRASBB,XRSBB,KGAM	
C			
7		GO TO (10,20,30,40,50,60,70,80,90,110,90,100,110,120),KGAM	67690
8	10	GAMA1=(1.570795-THR-ALP)/R2	67700
9		GO TO 130	67710
10	20	GAMA1=A(1)-THR	67720
11		GO TO 130	67730
12	30	GAMA1=A(2)-THR	67740
13		GO TO 130	67750
14	40	GAMA1=(A(1)*R3-ALP)/R3-THR	67760
15		GO TO 130	67770
16	50	GAMA1=(A(2)*R4+ALP)/R4 - THR	67780
17		GO TO 130	67790
18	60	GAMA1=A(3)-THR	67800
19		GO TO 130	67810
20	70	GAMA1=(A(3)*R5+ALP)/R5-THR	67820
21		GO TO 130	67830
22	80	GAMA1=(A(4)*R6+ALP)/R6-THR	67840
23		GO TO 130	67850
24	90	GAMA1=A(4)-THR	67860
25		GO TO 130	67870
26	100	GAMA1=(A(5)*R7-ALP)/R7-THR	67880
27		GO TO 130	67890
28	110	GAMA1=A(5)-THR	67900
29		GO TO 130	67910
30	120	GAMA1=(1.570795*R8-ALP)/R8-THR	67920
31	130	RETURN	67930
32		END	67940

[illegible]

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I N D E X

SUBROUTINE GAMSUB

PAGE 107

[illegible]

1	SUBROUTINE HAPSBC	67960
	CC	68040
C	SUBROUTINE HAPSBC SETS UP THE CORRECT EQUATIONS TO DETERMINE	68060
C	THE COORDINATES (XOP, YOP, ZOP) FOR THE POINTS POA-PRIME, PIA	68070
C	PRIME, AND PJA PRIME FOR THE BLOCK I ANALYSIS OF THE INTERSECTING	68080
C	PLANES FOR SECTORS J AND 11 IN SUBROUTINE SCI (SECTION 5.2.1.1.2).	68090
	CC	68110
2	COMMON/XUAPW/RAAP,XRATAP,THRAP,GAMA1AP,GAMA2AP,XOAP,YOAP,ZOAP,	
	1 XZAP,YZAP,ZZAP,X1AP,Y1AP,Z1AP,OP(3),TG2AP,STRAP,	
	2 CTRAP,AAAP,BAP,CAP,DAP,BIAUAP,SOAP(4),ALTAP	
3	COMMON/XOWORK/XO,YO,ZO,X2,Y2,Z2,X1,Y1,Z1,XJ,YJ,Y3,Y3,TANGM2,SINTHR,	
	1 COSTHR,TANPH1,AO,BO,CO,DO,BT40,SINGM2,COSGM2,	
	2 SINGM1,COSM1,AL10	
4	COMMON/PARMM/RAT,XRAT,THR,GAMA1,GAMA2,Z1A1	
5	COMMON/PARMS/IC4N	
6	CALL RASUB3	68130
7	RAAP=RAT	68140
8	CALL XHSUB3	68150
9	XRATAP=XRAT	68160
10	CALL THE1A2(RAT,XRAT,F4R)	68170
11	THRAP=THR	68180
12	CALL GAMSU3	68190
13	GAMA1AP=GAMA1	68200
14	CALL GAMA25	68210
15	GAMA2AP=GAMA2	68220
16	IF(IC4N.EQ.5)GO TO 10	68230
17	CALL POSUB	68240
18	CALL PISUB	68250
19	CALL PJSUB	68260
20	CALL TRAN(XO,XOAP,25)	
21	RETURN	68310
22	END	

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I N D E X

SUBROUTINE MAP\$BC

PAGE 109

SYMBOL

REFERENCES

10	16	21*
AAP	2C0	
ALTAR	2C0	
ALTO	3C0	
AD	3C0	
MAP	2C0	
BB	3C0	
BTAO	3C0	
BTADAP	2C0	
CAP	2C0	
CO	3C0	
COSGM1	3C0	
COSGM2	3C0	
COSTHR	3C0	
CTRAP	2C0	
DAP	2C0	
DO	3C0	
GAMA1	4C0	13
GAMA2	4C0	15
GAMAZ5	14*	
GAMSUB	12*	
GOMIAP	2C0	13*
GAMZAP	2C0	15*
HAPSOC	1*	
ICHN	5C0	16
OSP	2C0	
PARKM	4*	
PARM3	5*	
POSUM	17*	
PISUM	18*	
PDSUB	19*	
HAAR	2C0	7*
MSUBR	4*	
RAT	4C0	7* 10AG
RETURN	21*	
SINGM1	3C0	
SINGM2	3C0	
SINTHR	3C0	
SOAP	2C0	
STRAP	2C0	
TANGM2	3C0	
TANPH1	3C0	
TGZAP	2C0	
THETAR	10*	
THR	4C0	10AG 11
THRAP	2C0	11*
TRAN	20*	
XO	3C0	20AG
XOAP	2C0	20AG
XOAPW	2*	
XOWORK	3*	
XRAT	4C0	9 10AG
XRATAP	2C0	9*

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I N D E X

SUBROUTINE HAPSBC

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#	XRSUBB	-	B*
	X1	-	3C0
	X1AP	-	2C0
	X2	-	3C0
	X2AP	-	2C0
	X3	-	3C0
	Y0	-	3C0
	Y0AP	-	2C0
	Y1	-	3C0
	Y1AP	-	2C0
	Y2	-	3C0
	Y2AP	-	2C0
	Y3	-	3C0
	Z0	-	3C0
	Z0AP	-	2C0
	Z1	-	3C0
	Z1AP	-	2C0
	Z1AT	-	4C0
	Z2	-	3C0
	Z2AP	-	2C0
	Z3	-	3C0

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1      SUBROUTINE HASUBC                                68370
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 68440
C      SUBROUTINE HASUBC SETS UP THE CORRECT VARIABLES TO DETERMINE THE 68460
C      COORDINATES (X0, Y0, Z0) OF THE POINTS P0A, P1A, AND P3A THAT LIE 68470
C      ON THE PSEUDOELLIPSOID PRODUCED IN THE BLOCK I ANALYSIS OF THE 68480
C      INTERSECTING PLANE FOR SECTORS 3 AND 11 IN SUBROUTINE SCI (SECTION 68490
C      5.2.1.1.2).                                         68500
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 68520
2      COMMON/X0A,Y0A,XRA1A,THRA,GAMA1A,GAMA2A,X0A,Y0A,Z0A,X2A,Y2A,
          1          Z2A,X1A,Y1A,Z1A,X3A,Y3A,Z3A,TANG2A,SINTRA,COSTRA,
          2          TANPIA,AAAA,BA,CA,DA,H1A0A,SINGA2,COSGA2,SINGA1,
          3          COSGA1,ALTA
          4      COMMON/XWORK/X0,Y0,Z0,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTHR,
          5          1          COSTHR,TANPHI,AD,B0,C0,D0,H1A0,SINGM2,COSGM2,
          6          2          SINGM1,COSGM1,ALFO
          7      COMMON/PAARM/RAT,XRA1,THR,GAMA1,GAMA2,Z1A1
          8      COMMON/PAHNS/ICHN
          9      CALL HASUBH                                68540
         10      XAA=RAT                                    68550
         11      CALL XHSUBH                                68560
         12      XRA1=XRA1                                  68570
         13      CALL THEIAR(RAT,XRA1,THR)                  68580
         14      THRA=THR                                    68590
         15      CALL GANSUB                                68600
         16      GAMA1A=GAMA1                                68610
         17      CALL GAMA2S                                68620
         18      GAMA2A=GAMA2                                68630
         19      IF(ICHN.EQ.5) GO TO 10                      68640
         20      CALL POSUB                                68650
         21      CALL P1SUB                                68660
         22      CALL P3SUB                                68670
         23      CALL TRAN(X0,X0A,25)
         24      RETURN                                     68720
         25      END

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SYMBOL	-----	REFERENCES	-----
IO	-	16	21*
AAAA	-	2CO	
ALTA	-	2CO	
ALTO	-	3CO	
AO	-	3CO	
BA	-	2CO	
BO	-	3CO	
BTAO	-	3CO	
BTAOA	-	2CO	
CA	-	2CO	
CO	-	3CO	
COSGA1	-	2CO	
COSGA2	-	2CO	
COSGM1	-	3CO	
COSGM2	-	3CO	
COSTHR	-	3CO	
COSTRA	-	2CO	
DA	-	2CO	
DO	-	3CO	
GAMA1	-	4CO	13
GAMA1A	-	2CO	13=
GAMA2	-	4CO	15
GAMA2A	-	2CO	15=
* GAMA2S	-	14*	
* GAMSUB	-	12*	
* HASUBC	-	1*	
ICHN	-	5CO	16
* PARMN	-	4*	
* PARMS	-	5*	
* POSUB	-	17*	
* PISUB	-	18*	
* P3SUB	-	19*	
* RAA	-	2CO	7=
* HASUBB	-	6*	
RAT	-	4CO	7 10AG
* RETURN	-	21*	
SINGA1	-	2CO	
SINGA2	-	2CO	
SINGM1	-	3CO	
SINGM2	-	3CO	
SINTHR	-	3CO	
SINTRA	-	2CO	
TANGM2	-	3CO	
TANG2A	-	2CO	
TANPH1	-	3CO	
TANPIA	-	2CO	
* THETA	-	10*	
THR	-	4CO	10AG 11
THRA	-	2CO	11=
* TRAN	-	20*	
XO	-	3CO	20AG
XOA	-	2CO	20AG
* XOAWOR	-	2*	

I N D E X

SUBROUTINE HASUBC

PAGE 113

*	XOWORK	-	3*		
	XKAT	-	4C0	9	10AG
	XKATA	-	2C0	9=	
*	XRSUBB	-	3*		
	X1	-	3C0		
	X1A	-	2C0		
	X2	-	3C0		
	X2A	-	2C0		
	X3	-	3C0		
	X3A	-	2C0		
	Y0	-	3C0		
	Y0A	-	2C0		
	Y1	-	3C0		
	Y1A	-	2C0		
	Y2	-	3C0		
	Y2A	-	2C0		
	Y3	-	3C0		
	Y3A	-	2C0		
	Z0	-	3C0		
	Z0A	-	2C0		
	Z1	-	3C0		
	Z1A	-	2C0		
	Z1AT	-	4C0		
	Z2	-	3C0		
	Z2A	-	2C0		
	Z3	-	3C0		
	Z3A	-	2C0		

68740
68820
68840
68850
68860
68870
68880
68900

68920
68930
68940
68950
68960
68970
68980
68990
69000
69010
69020
69030
69040
69050

69100

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SYMBOL	-----	REFERENCES	-----
10	--	16	21*
ABP	--	200	
ALTBP	--	200	
ALTO	--	300	
AO	--	300	
BBP	--	200	
BO	--	300	
BTAO	--	300	
BTAUBP	--	200	
CBP	--	200	
CO	--	300	
COSGM1	--	300	
COSGM2	--	300	
COSTHR	--	300	
CTRP	--	200	
DBP	--	200	
DO	--	300	
GAMA1	--	400	13
GAMA2	--	400	15
* GAMA25	--	14*	
* GAMSUB	--	12*	
GAM1BP	--	200	13=
GAM2BP	--	200	15=
* HBPSBC	--	1*	
ICHN	--	500	16
OBP	--	200	
* PARM	--	4*	
* PARM5	--	5*	
* POSUB	--	17*	
* PISUB	--	18*	
* P3SUB	--	19*	
RABP	--	200	7=
* RASUBB	--	6*	
RAT	--	400	7 10AG
* RETURN	--	21*	
SINGM1	--	300	
SINGM2	--	300	
SINTHR	--	300	
SOBP	--	200	
STRBP	--	200	
TANGM2	--	300	
TANPH1	--	300	
TGZBP	--	200	
* THETAR	--	10*	
THR	--	400	10AG 11
THRBP	--	200	11=
TP1BP	--	200	
* TRAN	--	20*	
XO	--	300	20AG
XOBP	--	200	20AG
* XOBPW	--	2*	
* XOWORK	--	3*	
XRAT	--	400	9 10AG

* ARATBP - 200 9=
* ARSUBB - 80
X1 - 300
X1BP - 200
X2 - 300
X2BP - 200
X3 - 300
Y0 - 300
Y0BP - 200
Y1 - 300
Y1BP - 200
Y2 - 300
Y2BP - 200
Y3 - 300
Z0 - 300
Z0BP - 200
Z1 - 300
Z1AT - 400
Z1BP - 200
Z2 - 300
Z2BP - 200
Z3 - 300

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1      SUBROUTINE HBSUBC                                69170
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 69200
C      SUBROUTINE HBSUBC SETS UP THE CORRECT VARIABLES TO DETERMINE 69220
C      THE COORDINATES (X0,Y0,Z0) OF THE POINTS P0H,PIH, AND 69230
C      P3H THAT LIE ON THE PSEUDOELLIPSOID PRODUCED IN THE BLOCK 69240
C      1 ANALYSIS OF THE INTERSECTING PLANES FOR SECTORS 3 AND 11 69250
C      IN SUBROUTINE SCI.(SECTION S.2.1.1.2) 69260
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 69280
2      COMMON/XOBWOR/RAH,XRATB,THRH,GAMA1B,GAMA2B,X0B,Y0B,Z0B,X2B,Y2B,
1          Z2B,X1B,Y1B,Z1B,X3B,Y3B,Z3B,TANG2B,SINTRB,COSTRB,
2          TANPIB,ASB,BB,CB,DB,BTACH,SINGB2,COSGB2,SINGB1,
3          COSGB1,ALTB
3      COMMON/XOWORK/X0,Y0,Z0,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTR,
1          COSTHR,TANPH1,A0,B0,C0,D0,BTAA,SINGM2,COSGM2,
2          SINGM1,COSGM1,ALTQ
4      COMMON/PARMH/RAT,XRAT,THR,GAMA1,GAMA2,Z1AT
5      COMMON/PARMS/ICNV
6      CALL RASUBH                                69300
7      RAH=RAT                                69310
8      CALL XRSUBH                                69320
9      XRATB=XRAT                                69330
10     CALL THETAR(RAT,XRAT,THR)                69340
11     THRB=THR                                69350
12     CALL GAMSUB                                69360
13     GAMA1B=GAMA1                                69370
14     CALL GAMA2S                                69380
15     GAMA2B=GAMA2                                69390
16     IF(ICNV.EQ.5)GO TO 10                    69400
17     CALL POSUB                                69410
18     CALL PISUB                                69420
19     CALL P3SUB                                69430
20     CALL TRAN(X0,X0B,25)
21     10 RETURN                                69480
22     END

```

SYMBOL	-----	REFERENCES	-----
ID	16	21*	
ABB	200		
ALID	200		
ALTO	300		
AO	300		
BB	200		
BO	300		
BTAO	300		
BTAOB	200		
CB	200		
CO	300		
COSGB1	200		
COSGB2	200		
COSGM1	300		
COSGM2	300		
COSTHR	300		
COSTRB	200		
DB	200		
DO	300		
GAMA1	400	13	
GAMA1B	200	13=	
GAMA2	400	15	
GAMA2B	200	15=	
* GAMA2S	14*		
* GAMSUB	12*		
* HBSUBC	1*		
* ICHN	300	16	
* PARM	4*		
* PAR4S	5*		
* POSUB	17*		
* PISUB	18*		
* P3SUB	19*		
* RAB	200	7=	
* RASUBB	6*		
* RAT	400	7	10AG
* RETURN	21*		
SINGB1	200		
SINGB2	200		
SINGM1	300		
SINGM2	300		
SINTHR	300		
SINTRB	200		
TANGM2	300		
TANG2B	200		
TANPH1	300		
TANPHB	200		
* THETAR	10*		
* THR	400	10AG	11
* THRB	200	11=	
* TRAN	20*		
* XO	300	20AG	
* XOB	200	20AG	
* XOBWOR	2*		

INDEX

SUBROUTINE HBSUBC

PAGE 119

```

* XOWOKK - 3#
  XRAI - 4C0 9 10AG
  XRATU - 2C0 9#
* XRSUSH - B#
  A1 - 3C0
  A1B - 2C0
  A2 - 3C0
  A2B - 2C0
  A3 - 3C0
  A3B - 2C0
  Y0 - 3C0
  Y0B - 2C0
  Y1 - 3C0
  Y1B - 2C0
  Y2 - 3C0
  Y2B - 2C0
  Y3 - 3C0
  Y3B - 2C0
  Z0 - 3C0
  Z0B - 2C0
  Z1 - 3C0
  Z1AT - 4C0
  Z1B - 2C0
  Z2 - 3C0
  Z2B - 2C0
  Z3 - 3C0
  Z3B - 2C0

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1      SUBROUTINE HDNSUB
C      SUBROUTINE HDNSUB SETS UP THE CORRECT VARIABLES TO PERFORM THE
C      BLOCK 1, 24, 26, AND 3 ANALYSIS OF THE HEAD END WITH WER (SECTION
C      5.2.1).
C      SUBROUTINE HDNSUB SETS UP THE CORRECT VARIABLES TO PERFORM THE
2      COMMON/INPH/TA,HTAOE,BH,BH,ADHM,RIG,PAR
3      COMMON/INPH/ID/DELTA,PA,PHI,HCG,DFI,Z,KDUMP(72)
4      COMMON/WORKA/ALNC,AND,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
5      1      ALS1,ALS2,ALA,ALB,ALE,AA(5)
6      COMMON/COMG/TAU2(101),RH2(101),TAU7(101),RH7(101),PD(101),
7      1      TAUWOP(101),RB,VF,DWDOT,VP
8      COMMON/COMO/DELLO,DELLDI
9      COMMON/COMT/TAU,RC,SUMDV,XR,HL,AL(11),XBARTH,ASE,APF,WI,WI,RA,
10     1      RAO,ALL,AJPP,AST
11     COMMON/COMU/VRX,ALITU,COUNT,VFHEWI,VEX,VR,ASTO,AHGR
12     COMMON/COMV/VSTR,VSTO,TOMAX,DOIA,DOIB,XMAX,ZMAX,YMAX,ALHO,
13     1      ROPE1,ROPE2,ROPE3,ALDP
14     COMMON/PARMB/AP,PMIN,PMAX,WDOT,III,IJJ,WDOTD,NSLOT,NTAKE,NIME,
15     1      TAU0,TOTLAG,NINCP,BRNOUT,IIS,IS1,IS2,NI,SCUR(18,2)
16     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKOT,PON,DIS,APN,AT,
17     1      AMW,AKRST
18     COMMON/PARMH/BIE,BOE,AAVN,BX,RXX,AS11,DELLRI,ROPE4,AIE,YPI,ZPI,
19     1      AKCO,AKCI,ROPE1,ALITTL,Z1,AIG,THRI,THRO,AOF
20     COMMON/PARMS/ICHN
21     AANN=AND
22     IF(TAU)20,10,20
23     10     VRX=0.
24     ALITU=0.
25     COUNT=0.
26     VFHEWI=0.
27     ALHO=0.
28     VSTR=0.
29     VSTO=0.
30     VEX=0.
31     VR=0.
32     ASYU=0.
33     20     AOE=RF-TAUW
34     AIE=RF
35     BOE=(RF-TAUW)/BTAOE
36     BIE=RF/BH
37     DELLOI=RF/1000.
38     DELLRI=DELLDI
39     DELLO=DELLDI
40     IF(TAU)40,30,40
41     30     BTAOE=BTAOE-1./30000.
42     DO 50 L=1,8
43     CALL SCI(L)
44     IF(ICHN.EQ.5)GO TO 110
45     50     CONTINUE
46     L=14
47     CALL SCI(L)
48     IF(ICHN.EQ.5)GO TO 110
49     L=L-1
50     IF(L-8)70,70,60

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69500
69650
69670
69680
69690
69710
69730
69750
69760
69770
69780
69790
69800
69810
69820
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69840
69870
69880
69890
69900
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70000
70010
70020

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I N D E X

SUBROUTINE HUNSUB

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44	70	CALL SCTOR1	70060
45		CALL SCTOR2	70080
46		CALL VOLSUB	70090
47		KDP = 4	70100
48		IF(KDUMP(1))80,100,80	70110
49	80	WRITE(6,90)KDP,III,IJJ,YAUZ(III),RBZ(IJJ),	70120
		XSUMOV,VF,ASE,AP,WDOT,DWDOT	70130
50	90	FORMAT(4H STA,13,3X,2I5,1P9E10.2)	70140
51	100	CONTINUE	70150
52	110	RETURN	
53		END	

SYMBOL	-----	REFERENCES	-----
10	-	15	16*
20	-	15	26*
30	-	33	36*
40	-	33	36*
50	-	1500	36*
60	-	40*	43
70	-	43	44*
80	-	46	49*
90	-	49WR	50*
100	-	48	51*
110	-	37	41
AANN	-	1200	14*
ABIGR	-	800	
AFF	-	700	
AIG	-	1200	
AINC	-	400	
AINCW	-	1100	
AJPP	-	700	
AKGY	-	1100	
AKRSI	-	1100	
AL	-	700	
ALA	-	400	
ALB	-	400	
ALDP	-	900	
ALE	-	400	
ALHO	-	900	20=
ALITU	-	800	17=
ALITTL	-	1200	
ALL	-	700	
ALS1	-	400	
ALS2	-	400	
AMPN	-	1100	
AMW	-	1100	
ANO	-	400	14
AOE	-	1200	26=
AOHM	-	200	
AP	-	1000	49WR
ARCO	-	1200	
ARC1	-	1200	
ASE	-	700	49WR
ASI	-	700	
ASI1	-	1200	
ASTO	-	800	25=
AT	-	1100	
AW	-	400	
A1E	-	1200	27=
BH	-	200	29
BOE	-	1200	28=
BRNOUT	-	1000	
BTAOE	-	200	28
dx	-	1200	34=
B1E	-	1200	29=
COMG	-	5*	

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I N D E X

SUBROUTINE HDNSUB

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* COMQ	-	6*							
* COMT	-	7*							
* COMU	-	8*							
* COMV	-	9*							
COUNT	-	8C0	18=						
DELF	-	3C0							
DELLO	-	6C0	32=						
DELLOI	-	6C0	30=	31	32				
DELLRI	-	12C0	31=						
DELTA	-	11C0							
DELZ	-	3C0							
DH1	-	2C0							
D1S	-	11C0							
D01A	-	9C0							
D01B	-	9C0							
DW00T	-	5C0	49WR						
HCO	-	3C0							
* HDNSUB	-	1*							
HE	-	7C0							
HHR	-	2C0							
ICHN	-	13C0	37	41					
III	-	10C0	49WR						
IIJ	-	10C0	49WR						
IIS	-	10C0							
* INPUTA	-	2*							
* INPUTU	-	3*							
IS1	-	10C0							
IS2	-	10C0							
KDP	-	47=	49WR						
KDUMP	-	3C0	4H						
L	-	3500	36AG	39=	40AG	42=	43		
NI	-	10C0							
NINCPL	-	10C0							
NSLOT	-	10C0							
NTABE	-	10C0							
NTME	-	10C0							
P	-	11C0	49WR						
PA	-	3C0							
* PARMB	-	10*							
* PARMF	-	11*							
* PARMH	-	12*							
* PARMS	-	13*							
PD	-	5C0							
PH	-	11C0							
PHI	-	3C0							
PMAX	-	10C0							
PHIN	-	10C0							
PON	-	11C0							
RA	-	7C0							
RAO	-	7C0							
RB	-	5C0							
RBZ	-	5C0	49WR						
RBZTO	-	5C0							
XC	-	7C0							
* RETURN	-	52*							

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I N D E X

SUBROUTINE RONSUB

PAGE 124

RF	-	400	20	21	28	29	30
RIG	-	200					
ROPE1	-	1200					
ROPE1	-	900					
ROPE2	-	900					
ROPE3	-	900					
ROPE4	-	1200					
RXX	-	1200					
R2	-	400					
R3	-	400					
R4	-	400					
R5	-	400					
R6	-	400					
R7	-	400					
R8	-	400					
* SCI	-	36*	40*				
* SCTOR1	-	44*					
* SCTOR2	-	45*					
SCUR	-	1000					
SUMOV	-	700	49WR				
I	-	1100					
IAU	-	700	15	33			
IAUTO	-	1000					
IAUW	-	400	26	28			
IAUWDH	-	500					
IAUZ	-	500	49WR				
IAUZTO	-	500					
IDMAX	-	900					
IHR1	-	1200					
IHR0	-	1200					
TIME	-	1100					
IOFLAG	-	1000					
U	-	1100					
VEX	-	800	23=				
VF	-	500	49WR				
VFHEWI	-	800	19=				
* VOLSUB	-	46*					
VP	-	500					
VR	-	800	24=				
VRX	-	800	16=				
VSTU	-	900	22=				
VSTR	-	900	21=				
WDUT	-	1000	49WR				
WDOTD	-	1000					
WI	-	700					
* WDRKA	-	4*					
WT	-	700					
XBAKIH	-	700					
XMAX	-	900					
XR	-	700					
YMAX	-	900					
YPI	-	1200					
Z1	-	1200					
ZMAX	-	900					
ZP1	-	1200					

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I N D E X

SUBROUTINE HDNSUB

PAGE 125

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1      SUBROUTINE HESUB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      SUBROUTINE HESUB DETERMINES THE LENGTH OF THE ZONES IN HF END
C      SECTIONS FROM WHICH THE INCREMENTAL SURFACE AREAS IN SUBROUTINE
C      HESUB ARE DETERMINED (SECTION 5.2.3.2)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
2      COMMON/WORKA/A14C,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1      ALS1,ALS2,ALA,ALB,ALE,AW(5)
3      COMMON/WORKOE/DE1,HE,AEEM
4      COMMON/WORKRE/RE1,ALFEM,ALFE,RE2,HE1,HE2,HEO,HER,VFFO,VCE,
1      TAUED,TAJEL,CAE,CHE,CCCE,CCVE,CCCF,CUVE,CECE,CFVF
5      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBATH,ASE,AFF,WI,WT,RA,
1      RAO,ALL,AJPP,ASI
6      COMMON/PARMAB/HSUMMG,NSJBMG,NEND,ASEA,ASEB,SUMDVA,SUMDVB
7      COMMON/PARMAC/HEA,HEB,AEEA,AEEB,DVA,DVB,HEIA,HFIR,AWFA,AWEB,DELM
8      IF (RE1-RA) 10,20,30
9      IF (RC-RA) 40,30,30
10     20 HE=HER-TAU
11     GO TO 70
12     30 HE=HER-SURT(TAU**2-(RA-RE1)**2)
13     GO TO 70
14     40 IF (RE2-RA) 60,50,50
15     50 HE=HER-(RA-RE1)*HE1/(RE2-RE1)
16     GO TO 70
17     60 HE=HER+(SURT(RF**2-RA**2)/RE1)-HEO
18     70 DELH=HER-HEO
19     IF (HE.LE.(HSUMMG)) 30 TO 80
20     HEA=HSUMMG
21     HER=HE-HEA
22     GO TO 90
23     80 HEA=HE
24     HER=0.0.
25     90 RETURN
26     END

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55490

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SYMBOL	-----	REFERENCES	-----
10	-	6	9*
20	-	8	10*
30	-	9	12*
40	-	9	14*
50	-	14	15*
60	-	14	17*
70	-	11	13
80	-	19	23*
90	-	22	25*
AE EA	-	7C0	
AE EB	-	7C0	
AFF	-	5C0	
AINC	-	2C0	
AJPP	-	5C0	
AL	-	5C0	
ALA	-	2C0	
ALB	-	2C0	
ALE	-	2C0	
ALFE	-	4C0	
ALFEM	-	4C0	
ALL	-	5C0	
ALS1	-	2C0	
ALS2	-	2C0	
AND	-	2C0	
AOEM	-	3C0	
ASE	-	5C0	
ASEA	-	6C0	
ASEB	-	6C0	
ASI	-	5C0	
AW	-	2C0	
AW EA	-	7C0	
AW EB	-	7C0	
BE	-	3C0	17
CAE	-	4C0	
CBE	-	4C0	
CCCE	-	4C0	
CCVE	-	4C0	
CDCE	-	4C0	
CDVE	-	4C0	
CECE	-	4C0	
CEVE	-	4C0	
COMI	-	5*	
DELH	-	7C0	18=
DEI	-	3C0	
DVA	-	7C0	
DVB	-	7C0	
HE	-	5C0	10= 12= 15= 17= 19 21 23
HEA	-	7C0	20= 21 23=
HEB	-	7C0	21= 24=
HE1A	-	7C0	
HE1B	-	7C0	
HEU	-	4C0	17 18
HER	-	4C0	10 12 15 17 18

PAGE 12A

*	HESUB	-	1*						
	HE1	-	4C0	15					
	HE2	-	4C0						
	ASUBMG	-	6C0	19	20				
	NEND	-	6C0						
	NSUBMG	-	6C0						
#	PARMAB	-	6*						
*	PARMAC	-	7*						
	KA	-	5C0	8	9	12	14	15	17
	KAO	-	5C0						
	KC	-	5C0	9					
*	RETURN	-	25*						
	KE1	-	4C0	8	12	15			
	KE2	-	4C0	14	15				
	KF	-	2C0	17					
	KZ	-	2C0						
	KJ	-	2C0						
	K4	-	2C0						
	K5	-	2C0						
	K6	-	2C0						
	K7	-	2C0						
	K8	-	2C0						
*	SQRT	-	12	17					
	SUMDV	-	5C0						
	SUMDVA	-	6C0						
	SUMDVH	-	6C0						
	TAU	-	5C0	10	12				
	TAUED	-	4C0						
	TAUE1	-	4C0						
	TAUH	-	2C0						
	VCE	-	4C0						
	VFED	-	4C0						
	W1	-	5C0						
#	WORKA	-	2*						
*	WORKDE	-	3*						
*	WORKNE	-	4*						
	WT	-	5C0						
	XHAMIH	-	5C0						
	XR	-	5C0						

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```

1  SUBROUTINE 134
2  C      INTERNAL BALLISTICS MODULE MAIN ROUTINE
3  COMMON/CONSTS/GNOT,PI,PIOP,RADIAN
4  COMMON/INPUT1/AINCIN(18),ANO(18),RF(18),TAUW(18),R2(18),
5      R3(18),R4(18),R5(18),R6(18),R7(18),R8(18),
6      ALS1(18),ALS2(18),ALA(18),ALB(18),ALE(18),AO1(18),
7      AO2(18),AO3(18),AO4(18),AO5(18)
8  COMMON/INPUT2/THO(18),TSLVR(18)
9  COMMON/INPUT3/GEOCON(45,18)
10 COMMON/INPUT4/NGEO(18),APORT(18),TAUPL(50,18),ALPPL(50,18),
11     AKGYP(50,18),TAUHD(50),ABHD(50),PMUHD(50),
12     RMOHD(50),XCGHD(50),TAUN(50),ABN(50),PNOIN(50),
13     RMOIN(50),XCGN(50),NGEOMD,NGEOMN
14 COMMON/INPUTA/BTADE,DH1,3H,AOHM,RIG,HHR
15 COMMON/INPUTD/AKRH,AKR4,RBFLAG
16 COMMON/INPUTE/ACKG(5),AKU(5),AKR(39),AKSLOT(2),NAKR,TIMAKR(25),
17     TBLAKR(25),NAKEND
18 COMMON/INPUTF/NPH,PHST(70),TIMEPH(70),NAKRST,TAUAKR(30),
19     AKRTAU(30),NTAUTO,PCTAB
20 COMMON/INPUTG/CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
21     AMWG(20),TCOMB(20),NCSCOE
22 COMMON/INPUTH/AINCPL,VCHINP,VCNINP
23 COMMON/INPUTI/AN2,CM,DE,DT,ANN
24 COMMON/INPUTJ/JNOT,TIMEJT(25),TDELOT(25),EMBAR,EREXP,PONBAR
25 COMMON/INPUTK/NCM,TBLCM(50),TIMECM(50),TIMAX,CKDUMP(80),NPA,
26     TIMEPA(50),THLPA(50)
27 COMMON/INPUTL/PRIFLG,NWRTAB,INPUTAB
28 COMMON/INPUTM/STFLAG,STOYST,DEL1ST,DEL1SS,DEL1TO
29 COMMON/INPUTN/AITST,PST,TST,TIMPT1,TIMPT2,DEL1SP,ANITW
30 COMMON/INPUTO/KPLANE,KMOICG
31 COMMON/INPUTP/NEPS,TIMEPS(50),EPCA(50),EPCN(50),VACCEL,ACCELT(50),
32     TIMEAC(50)
33 COMMON/INPUTQ/CRP,CRT,CRW
34 COMMON/INPUTR/WFACT,RHOTOL,WFTOL
35 COMMON/INPUTS/DIAU(18),DTAUW(18)
36 COMMON/INPUTT/SB(18),SLTBRN(18),SA(18)
37 COMMON/INPUTU/DELF,PA,PHI,HCO,DEL2,KDUMP(72)
38 COMMON/WORKRN/RN1(8),VFNO,VCN,ACK(10)
39 COMMON/DUMYM/CKTIME,NTEST4
40 COMMON/DUMYP/AFX,AFY,AKGYH1,ALPHI,TAUW,THOLD
41 COMMON/DUMYV/GEORUN
42 COMMON/COMA/DELT,APHI,WDOTI,ANIHO,TIMEW,UI,ANLOPS,ACCEL,
43     ABCYL,PHNT(101,15),AINCHI,AMACH,ZCALC(101)
44 COMMON/COMJ/ABSLTA(18),ABSLTF(18),APA(18),APF(18),PSA(18),
45     PSF(18),POA(18),POF(18),TSA(18),TSF(18),UA(18),
46     UF(18),WSLOTG(18),WSLOTI(18)
47 COMMON/COMK/DWSLTA(18),DWSLTF(18),DWDTS(18),AFHI,RBSLTA(18),
48     RBSLTF(18),TSLOTA(18),TSLOTF(18)
49 COMMON/COMO/THSLV,THSLVM,THSLVV,ASLVR,AHO,RFHI,ALPX,APX,
50     RBHI,ALPY,APY,VSLVR
51 COMMON/PARM4/AP,PHIN,PMAX,WDOT,II,IIJ,WDDTD,NSLOT,NTARE,NTMF,
52     TAUTO,TOFLAG,NINCPL,BRNOU,IIS,IS1,IS2,NI,SCUR(18,2)
53 COMMON/PARM5/KRASUR,KXRSUR,AJBB,HE1,AJBN,AJBN,XRARI
54 COMMON/PARM6/RCG,DELLI,XBARIN,HCR,KWIT1,KWIT2,LSWIT1,ALSX,

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1      AJPV,AJPH
37     COMMON/PARMF/PH,TI,SE,AINCW,T,P,DELTA,U,ARGY,PON,DIS,AMPN,AT,
1      AMW,AKKST
38     COMMON/PARMI/AONCYL,AIHCYL,AIPCYL,AKGXX,AKGYY,VP4,VPV
39     COMMON/PARMA/F,EPI,PEPO,CFOL,VFWEB,WU,DFEU,CLOPS,CFD,WGTOT,
1      SWDUTN
40     COMMON/PARML/HOLDR,ALBA,BRAK,ALIA,ASIRPX,ZPD,YPD,DS,KHRAK,KVSTH
41     COMMON/PARMD/ALP,KRASB,KXRSB,KGAM
42     COMMON/PARMR/RHSLUT,RSLOTA,RSLOTF,SLTFLG
43     COMMON/PARMS/ICHN
44     COMMON/PARMAB/HSUBMG,VSJBMG,WEND,ASEA,ASEB,SUMDVA,SUMIVB
45     COMMON/PARMAC/HEA,HEB,AEFA,AEFB,DVA,DVB,HEIA,HEIB,AWFA,AWEB,DELH
46     COMMON/PARMAH/VNOZSB,THEFX,SINATL,NCONT
47     PI = 3.1415926536
48     PIO2 = 1.5707963265
49     GNOT = 32.174050
50     RADIAN = 57.2957795
51     ACCEL=0.0
52     ARGY=0.0
53     AFY=0.0
54     ANI40=0.0
55     ANITW=1.0
56     ANN=1.0
57     HRNDUT=0.0
58     CKTIME=0.0
59     GEORUN=0.0
60     PA=14.7
61     PEPO=1.0
62     PONHAR=0.0
63     PRFLG=1
64     SIKATC=0.0
65     THETEX=0.0
66     TADU=0.0
67     TOFLAG=0.0
68     TSLVDM=0.0
69     VNOZSB=0.0
70     WFACT=0.0
71     CWP = 0.0
72     CRT = 0.0
73     CRW = 0.0
74     CFOL=0.0
75     ICHN = 0
76     III = 0
77     IIJ = 0
78     IIS = 0
79     IS1 = 0
80     JS2 = 0
81     KBRK = 0
82     KGAM = 0
83     KMOTCG=1
84     KPLANE= 0
85     KRASB= 0
86     KRASUB= 0
87     KVSTH = 0
88     KWIT1 = 0

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89 KWT2 = 0
90 KKRSHB= 0
91 KKRSHB= 0
92 LSWIT1= 0
93 NACCEL = 0
94 NAKEND=0
95 NAKR=0
96 NAKRST= 0
97 NCM=0
98 NCONT=0
99 NCSCOE=1
100 NCSTR = 0
101 NDT=0
102 NEPS = 0
103 NI = 0
104 NINCPL= 0
105 NPA=0
106 NPH = 0
107 NSLOT = 0
108 NSUBMG=0
109 NTABE = 0
110 NTAUTO=1
111 NTME = 0
112 DO 5 I=1,18
113 AINCIN(I)=0.0
114 AND(I)=0.0
115 RF(I)=0.0
116 TAUW(I)=0.0
117 R2(I)=0.0
118 R3(I)=0.0
119 R4(I)=0.0
120 R5(I)=0.0
121 R6(I)=0.0
122 R7(I)=0.0
123 R8(I)=0.0
124 ALS1(I)=0.0
125 ALS2(I)=0.0
126 ALA(I)=0.0
127 ALB(I)=0.0
128 ALE(I)=0.0
129 A01(I)=0.0
130 A02(I)=0.0
131 A03(I)=0.0
132 A04(I)=0.0
133 A05(I)=0.0
134 THO(I)=0.0
135 TSLVR(I)=0.0
136 NGEO(I)=0
137 APDR(I)=0.0
138 DTAU(I)=0.0
139 DTAUW(I)=0.0
140 SA(I)=0.0
141 SB(I)=0.0
142 TSF(I)=0.0
143 UF(I)=0.0

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144      DWSLTF(I)=0.0
145      DWSLTA(I)=0.0
146      RWSLTF(I)=0.0
147      RWSLTA(I)=0.0
148      TSLUTF(I)=0.0
149      TSLUTA(I)=0.0
150      SLTHRR(I)=0.0
151      DO 10 I=1,50
152      TAUH(I)=0.0
153      ABH(I)=0.0
154      PMOIH(I)=0.0
155      RMGHI(I)=0.0
156      XCGH(I)=0.0
157      TAUH(I)=0.0
158      ABH(I)=0.0
159      PMOIH(I)=0.0
160      RMGHI(I)=0.0
161      10 XCGH(I)=0.0
162      DO 15 I=1,18
163      DO 15 J=1,50
164      TAUPL(J,I)=0.0
165      ALPPL(J,I)=0.0
166      15 AKGYP(J,I)=0.0
167      DO 20 I=1,18
168      DO 20 J=1,45
169      20 GEOCON(J,I)=0.0
170      HTAU=0.0
171      DH=0.0
172      RTG=0.0
173      HHR=0.0
174      AKPH=0.0
175      AKRN=0.0
176      AKHS=0.0
177      RIFLAG=0.0
178      DELH=0.0
179      DO 25 I=1,5
180      AKG(I)=0.0
181      25 AKU(I)=0.0
182      DO 30 I=1,39
183      AKR(I)=0.0
184      DO 35 I=1,2
185      35 AKSLOT(I)=0.0
186      PCTAH=0.0
187      AINCPL=0.0
188      VCHINP=0.0
189      VCNINP=0.0
190      VFNO=0.0
191      TIMAX=0.0
192      STFLAG=0.0
193      STDYST=0.0
194      SLTFLG=0.0
195      DELIST=0.0
196      DELTSS=0.0
197      DELITO=0.0
198      AITST=0.0

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I N D E X

SUBROUTINE IBM

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ALPX	-	33C0	
ALPY	-	33C0	
ALSX	-	36C0	
ALS1	-	3C0	124=
ALS2	-	3C0	125=
AL11A	-	40C0	
AL3A	-	40C0	
AMACH	-	30C0	
AMPN	-	37C0	
AMW	-	37C0	
AMWG	-	11C0	
ANIBU	-	30C0	54=
ANITW	-	18C0	55=
ANLOPS	-	30C0	
ANN	-	13C0	56=
ANJ	-	3C0	114=
AN2	-	13C0	
AOMM	-	7C0	
AOMCYL	-	38C0	
AQ1	-	3C0	124=
AQ2	-	3C0	130=
AQ3	-	3C0	131=
AQ4	-	3C0	132=
AQ5	-	3C0	133=
AP	-	34C0	
APA	-	31C0	
APF	-	31C0	
APH1	-	30C0	
APORT	-	6C0	137=
APX	-	33C0	
APY	-	33C0	
AS	-	40C0	
ASEA	-	44C0	
ASEB	-	44C0	
ASLVR	-	33C0	
AT	-	37C0	
AWEA	-	45C0	
AWEH	-	45C0	
BH	-	7C0	
BRBK	-	40C0	
BRNOUT	-	34C0	57=
BTADE	-	7C0	170=
CFO	-	39C0	
CFOL	-	39C0	74=
CKUUMP	-	15C0	
CKTIME	-	27C0	59=
CLOPS	-	39C0	
CM	-	13C0	
* COMA	-	30*	
* COMJ	-	31*	
* COMK	-	32*	
* COMO	-	33*	
* CONSTS	-	2*	
CRP	-	21C0	71=
CRT	-	21C0	72=

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CRW - 2100 13=
 CSTAR - 1100
 CSTR - 1100
 DE - 1300
 DEED - 3900
 DELF - 2500
 DELH - 4500 178=
 DELLI - 3600
 DELT - 3000
 DELTA - 3700
 DELTSP - 1800 203=
 DELTSS - 1700 196=
 DELTST - 1700 195=
 DELTTO - 1700 197=
 DELZ - 2500
 DH1 - 700 171=
 DIS - 3700
 DS - 4000
 DT - 1300
 DTAU - 2300 138=
 DTAUW - 2300 139=
 DUMYM - 27*
 DUMYP - 29*
 DUMYV - 29*
 DVA - 4500
 DVB - 4500
 DWDTS - 3200
 DWSLTA - 3200 145=
 DWSLTF - 3200 144=
 EPCA - 2000
 LPCN - 2000
 EP1 - 3900
 ERBAR - 1400
 EREXP - 1400
 F - 3900
 GAMA - 1100
 GAMAG - 1100
 GECCUN - 500 169=
 GEORUN - 2900 59=
 GNOT - 200 49=
 HCO - 2500
 HCR - 3600
 HEA - 4500
 HED - 4500
 HEI - 3500
 HEIA - 4500
 HEIB - 4500
 HHR - 700 173=
 HOLUK - 4000
 HSUBMG - 4400
 I - 11200

113	114	115	116	117	118	119	120	121	122	123	124
125	126	127	128	129	130	131	132	133	134	135	136
137	138	139	140	141	142	143	144	145	146	147	148
149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172
173	174	175	176	177	178	179	180	181	182	183	184
185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208
209	210	211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243	244
245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268
269	270	271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290	291	292
293	294	295	296	297	298	299	300	301	302	303	304
305	306	307	308	309	310	311	312	313	314	315	316
317	318	319	320	321	322	323	324	325	326	327	328
329	330	331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364
365	366	367	368	369	370	371	372	373	374	375	376
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	ICHN	-	43C0	75=			
	III	-	34C0	76=			
	IIJ	-	34C0	77=			
	IIS	-	34C0	78=			
*	INPUTA	-	7*				
*	INPUTD	-	8*				
*	INPUTF	-	9*				
*	INPUTF	-	10*				
*	INPUTG	-	11*				
*	INPUTH	-	12*				
*	INPUTI	-	13*				
*	INPUTJ	-	14*				
*	INPUTK	-	15*				
*	INPUTL	-	16*				
*	INPUTM	-	17*				
*	INPUTN	-	18*				
*	INPUTO	-	19*				
*	INPUTP	-	20*				
*	INPUTQ	-	21*				
*	INPUTR	-	22*				
*	INPUTS	-	23*				
*	INPUTT	-	24*				
*	INPUTU	-	25*				
*	INPUTV	-	3*				
*	INPUTW	-	4*				
*	INPUTX	-	5*				
*	INPUTY	-	6*				
	IS1	-	34C0	79=			
	IS2	-	34C0	80=			
	J	-	163D0	164	165	166	15800 167
	KAKAK	-	40C0	81=			
	KDUMP	-	25C0	205=			
	KGAM	-	41C0	82=			
	KHJICG	-	19C0	83=			
	KPLANE	-	19C0	84=			
	KRASCH	-	41C0	85=			
	KRASCH	-	35C0	86=			
	KVSTR	-	40C0	87=			
	KW111	-	36C0	88=			
	KW112	-	36C0	89=			
	KXRSBH	-	41C0	90=			
	KXRSBH	-	35C0	91=			
*	LINK1	-	210*				
*	LINK2	-	211*				
	LSW111	-	36C0	92=			
	NACCEL	-	20C0	93=			
	NAKEND	-	9C0	94=			
	NAKX	-	9C0	95=			
	NAKXST	-	10C0	96=			
	NCM	-	15C0	97=			
	NCUNT	-	46C0	98=			
	NCSCOE	-	11C0	99=			
	NCSTR	-	11C0	100=			
	NDT	-	14C0	101=			

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PAGE 170

	MEMO	-	4400	
	MEMS	-	2000	102=
	NGED	-	600	136=
	NGEDHD	-	600	207=
	NGEDMN	-	600	208=
	NI	-	3400	103=
	NINCPL	-	3400	104=
	NPA	-	1500	105=
	NPH	-	1000	106=
	NPUTAB	-	1600	209=
	NSLUT	-	3400	107=
	NSUBMG	-	4400	108=
	NTAB	-	3400	109=
	NTAUTO	-	1000	110=
	NTEST4	-	2700	
	NTME	-	3400	111=
	NWRTAB	-	1600	208=
	P	-	3700	
	PA	-	2500	60=
*	PARMAB	-	44*	
*	PARMAC	-	45*	
*	PARMAH	-	46*	
*	PARMB	-	34*	
*	PARMD	-	35*	
*	PARME	-	36*	
*	PARMF	-	37*	
*	PARMI	-	38*	
*	PARMK	-	39*	
*	PARML	-	40*	
*	PARMO	-	41*	
*	PARMR	-	42*	
*	PARMS	-	43*	
	PCTAB	-	1000	186=
	PEPD	-	3900	61=
	PH	-	3700	
	PHI	-	2500	
	PHST	-	1000	
	PI	-	200	47=
	PI02	-	200	48=
	PMAX	-	3400	
	PMIN	-	3400	
	PMOHD	-	600	154=
	PMOIN	-	600	159=
	PDA	-	3100	
	POF	-	3100	
	PON	-	3700	
	PONBAR	-	1400	62=
	PRESS	-	1100	
	PRNT	-	3000	
	PRTFLG	-	1600	63=
	PSA	-	3100	
	PSF	-	3100	
	PST	-	1800	199=
	R	-	1100	
	RADIAN	-	200	50=

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RBFLAG	-	800	177=
RHHI	-	3300	
RBSLOT	-	4200	
RBSLTA	-	3200	147=
RBSLTF	-	3200	146=
RCC	-	3600	
RETURN	-	212*	
RF	-	300	115=
RHHI	-	3300	
RHDTOL	-	2200	
RIG	-	700	172=
RMOIHD	-	600	155=
RMOIN	-	600	160=
RNI	-	2600	
RPI	-	4000	
RSLDTA	-	4200	
RSLDTF	-	4200	
R2	-	300	117=
R3	-	300	114=
R4	-	300	119=
R5	-	300	120=
R6	-	300	121=
R7	-	300	122=
R8	-	300	123=
SA	-	2400	140=
SH	-	2400	141=
SCUR	-	3400	
STWATC	-	4600	54=
STTRN	-	2400	150=
STFLG	-	4200	194=
STDYST	-	1700	193=
STFLAG	-	1700	192=
SUMDVA	-	4400	
SUMDVF	-	4400	
SMDUIN	-	3900	
I	-	1700	
TAUAKP	-	1000	
TAUHD	-	600	152=
TAUHW	-	2800	
TAUN	-	600	157=
TAUPL	-	600	164=
TAUTD	-	3400	66=
TAUW	-	300	116=
TBLAKR	-	900	
TBLCH	-	1500	
TBLPA	-	1500	
TCOMH	-	1100	
TDCLDT	-	1400	
THETEX	-	4600	65=
THO	-	400	134=
THOLD	-	2800	
THSLV	-	3300	
THSLVV	-	3300	
THAKR	-	900	
THMAX	-	1500	191=

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TIME	-	37C0	
TIMEAC	-	20C0	
TIMECM	-	15C0	
TIMEOT	-	14C0	
TIMEPA	-	15C0	
TIMEPH	-	10C0	
TIMEPS	-	20C0	
TIMEW	-	30C0	
TIMPT1	-	18C0	201=
TIMPT2	-	18C0	202=
TOFLAG	-	34C0	67=
TSA	-	31C0	
TSF	-	31C0	142=
TSLOTA	-	32C0	149=
TSLOTF	-	32C0	148=
TSLVOM	-	33C0	68=
TSLVR	-	4C0	135=
TST	-	18C0	200=
U	-	37C0	
UA	-	31C0	
UF	-	31C0	143=
UT	-	30C0	
VCHINP	-	12C0	188=
VCN	-	26C0	
VCNINP	-	12C0	189=
VFNO	-	26C0	190=
VFWEB	-	39C0	
VNUZSB	-	46C0	69=
VRH	-	38C0	
VRH	-	38C0	
VSLVR	-	33C0	
WD	-	39C0	
WDOT	-	34C0	
WDOTD	-	34C0	
WDOTI	-	30C0	
WFACT	-	22C0	70=
WFTOL	-	22C0	
WGTOT	-	39C0	
WORKRN	-	26*	
WSLUTO	-	31C0	
WSLOTI	-	31C0	
XBARI	-	35C0	
XBARIN	-	36C0	
XCGHD	-	6C0	156=
XCGN	-	6C0	161=
YPO	-	40C0	
ZCALC	-	30C0	
ZPO	-	40C0	

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31      DIMENSION SKA(18),SKF(18)
32      IOUT=6
33      IF (AMW.LT.1.0E-06) AMW=1545.2/4R
34      130  FORMAT(15X,7(1PE15.7))
35      NIP1=N1+1
36      FVACX=FVAC
37      FVAC=CFOL*PON*AT*ANN
38      IF (TIME) 160,160,170
39      160  FVACX=0.0
40      AITVAC=0.0
41      170  CONTINUE
42      AITVAC=AITVAC*(FVAC+FVACX)*DEL1/2.
43      IF (TIME.LT.1.0E-06) AITVAC=0.0
44      ABTUI=ABTUT+A3SLOT
45      VFCYL=VF-VFN-VFN
46      CALL FAMCAL(CFPROP,FINDP)
47      CALL OUTPUT
48      IF (PRTFLG.EQ.0.0) GO TO 490
49      IF (PRTFLG-2.) 295,260,260
50      260  CGCYL=AOMCYL/(DELF*VFCYL)
51      XBARIH=((XBH+HCO)*VFH*DELF+AOMCYL)-VFN*DELF*XBN)/WF
52      AJPP=AJPHED+AIPCYL+AJPN0Z
53      AJBHED=AJBHED-((XBH+HCO)**2-(XBH+HCO-XBARIH)**2)*VFH*DELF/GNOT
54      AJBN0Z=AJBN0Z-(XBN**2-(XBN-XBARIH)**2)*VFN*DELF/GNOT
55      TEMP=WF-(VFH+VFN)*DELF
56      TEMP1=(XBH+HCO)*DELF*VFH
57      TEMP2=XBN*DELF*VFN
58      AHCYL=AHCYL-((XBARIH*WF-TEMP1+TEMP2)/TEMP)**2*TEMP/GNOT
59      AJBH=AJBHED+AHCYL+AJBN0Z
60      WRITE(IOUT,270)
61      270  FORMAT('1CENTER OF GRAVITY AND MOMENT OF INERTIA DATA1')
62      TERM = XBARIH * A1
63      WRITE(IOUT,271) TERM,XBARIH
64      271  FORMAT('4, GRAIN CG (M,IN)',T51,'XBARIH',
65      $ T66,G15.8,T86,G15.8)
66      TERM = AJPP * A2
67      WRITE(IOUT,272) TERM,AJPP
68      272  FORMAT('4, GRAIN ROLL MOI (KG*M**2,SLUG*IN**2)',T51,'AJPP',
69      $ T66,G15.8,T86,G15.8)
70      TERM = AJBR * A2
71      WRITE(IOUT,273) TERM,AJBR
72      273  FORMAT('4, GRAIN XY MOI (KG*M**2,SLUG*IN**2)',T51,'AJBR',
73      $ T66,G15.8,T86,G15.8)
74      TERM = XBH * A1
75      WRITE(IOUT,274) TERM,XBH
76      274  FORMAT('4, HEAD END CG (M,IN)',T51,'XBH',
77      $ T66,G15.8,T86,G15.8)
78      TERM = AJPHED * A2
79      WRITE(IOUT,275) TERM,AJPHED
80      275  FORMAT('4, HEAD END ROLL MOI (KG*M**2,SLUG*IN**2)',T51,'AJPHED',
81      $ T66,G15.8,T86,G15.8)
82      TERM = AJBHED * A2
83      WRITE(IOUT,276) TERM,AJBHED
84      276  FORMAT('4, HEAD END XY MOI (KG*M**2,SLUG*IN**2)',T51,'AJBHED',
85      $ T66,G15.8,T86,G15.8)

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11400
11440
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11970
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12000
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80      TERM = CGCYL * A1
81      WRITE(IOUT,277) TERM,CGCYL
82      277 FORMAT(T4,'CYLINDER CG (M,IN)',T51,'CGCYL',
      $ T66,G15.8,T86,G15.8)
83      TERM = AIPCYL * A2
84      WRITE(IOUT,278) TERM,AIPCYL
85      278 FORMAT(T4,'CYLINDER ROLL MOI (KG*M**2,SLUG*IN**2)',T51,'AIPCYL',
      $ T66,G15.8,T86,G15.8)
86      TERM = AIBCYL * A2
87      WRITE(IOUT,279) TERM,AIBCYL
88      279 FORMAT(T4,'CYLINDER XY MOI (KG*M**2,SLUG*IN**2)',T51,'AIBCYL',
      $ T66,G15.8,T86,G15.8)
89      TERM = XBN * A1
90      WRITE(IOUT,280) TERM,XBN
91      280 FORMAT(T4,'AFT END CG (M,IN)',T51,'XBN',
      $ T66,G15.8,T86,G15.8)
92      TERM = AJPNQZ * A2
93      WRITE(IOUT,281) TERM,AJPNQZ
94      281 FORMAT(T4,'AFT END ROLL MOI (KG*M**2,SLUG*IN**2)',T51,'AJPNQZ',
      $ T66,G15.8,T86,G15.8)
95      TERM = AJBNQZ * A2
96      WRITE(IOUT,282) TERM,AJBNQZ
97      282 FORMAT(T4,'AFT END XY MOI (KG*M**2,SLUG*IN**2)',T51,'AJBNQZ',
      $ T66,G15.8,T86,G15.8)
98      IF(PRTFLG.EQ.2.) GO TO 490
99      295 CONTINUE
C****PRINT HEADING TITLE FOR EXPANDED PRINT****
100      IF(PRTFLG.LT.2.) WRITE(IOUT,283)
101      283 FORMAT(1H1)
102      WRITE(IOUT,284)
103      284 FORMAT(/12,'INCREMENT DIVIDING PLANE DATA:')
C****PRINT SUMMARY OF FORE HEAD DATA****
104      WRITE(IOUT,300) (PRNT(1,L),L=1,7), (PRNT(1,L),L=9,15)
105      300 FORMAT(1H0,2X,4HMASS,6X,2HPO,8X,1HP,8X,1HT,8X,1HU,8X,1HM,7X,2HLP,7
      XX,2HAP,6X,4HWDOT,5X,5HWDOT,4X,5HWD/DT,5X,2HRR,5X,3HTAU,4X,4HRTD,
      X3X,5HTAU/1H,
      X 8HADDITION/1H,7HREGIONS,4X,4HPS1A,5X,4HPS1A,4X,6HDEG, 8,3X,6HFI
      X/SEC,12X,6HINCHES,3X,7HSD, IN.,2X,6HLB/SEC,3X,6HLB/SEC,3X,6HLB/SEC
      X,3X,6HIN/SEC,3X,3HIN.,3X,6HIN/SEC,3X,3HIN.,//1X,4HFORF,2X,4F9.2,
      X2X,F7.3,5F9.2,F8.4,F7.3,F8.4,F7.3)
106      IIS=1
107      J=2
108      DO 350 K=J,NI
109      TEMP=SCUR(IIS,1)-TSLDTF(IIS)
110      IF(ZCALC(K)-TEMP) 340,320,320
111      320 CONTINUE
112      WRITE(6,330) SCUR(IIS,1), (PRNT(K,L),L=1,7), (PRNT(K,L),L=9,15)
113      330 FORMAT(1X,F8.3,4F9.2,2X,F7.3,5F9.2,F8.4,F7.3,F8.4,F7.3/)
114      GO TO 360
115      340 CONTINUE
116      WRITE(6,400) ZCALC(K), (PRNT(K,L),L=1,7), (PRNT(K,L),L=9,15)
117      350 CONTINUE
118      K = NI
119      360 IF(K-NI) 370,370,410
120      370 K=K+1

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121      TEMP=SCUR(IIS,2)+TSLOTA(IIS)
122      IF (K-NI) 380,380,410
123      380  IF (ZCALC(K)-TEMP) 370,395,390
124      390  K=K-1
125      395  CONTINUE
126      WRITE(6,400) SCUR(IIS,2), (PRNT(K,L), L=1,7), (PRNT(K,L), L=9,15)
127      400  FORMAT(1X,F8.3,4F9.2,2X,F7.3,5F9.2,F8.4,F7.3,F8.4,F7.3)
128      J=K+1
129      IIS=IIS+1
130      GO TO 310
131      C****PRINT SUMMARY OF AFT END DATA****
132      410  IF (NSUBMG.LE.0) GO TO 415
133      WRITE(6,416) (PRNT(NIP,I), I=1,5), PRNT(NIP,7), (PRNT(NIP1,I), I=9,11)
134      416  FORMAT(1X,'AFT(A)',2X,4F9.2,2X,F7.3,' .....',4F9.2,F8.4,F7.3,
135      X14H ..... )
136      NIP2=NIP+2
137      WRITE(6,417) (PRNT(NIP2,I), I=1,5), PRNT(NIP2,7), (PRNT(NIP2,I), I=9,11)
138      417  FORMAT(1X,'AFT(B)',2X,4F9.2,2X,F7.3,' .....',4F9.2,F8.4,F7.3,
139      X14H ..... //)
140      GO TO 425
141      415  WRITE(6,420) (PRNT(NIP1,I), I=1,5), PRNT(NIP1,7), (PRNT(NIP1,I), I=9,11)
142      420  FORMAT(1X,3AFT,2X,4F9.2,2X,F7.3,9H .....',4F9.2,F8.4,F7.3,
143      X14H ..... //)
144      425  IF (SCUR(1,1).GT.1.0E36) GO TO 490
145      C****PRINT SUMMARY OF SLOT DATA****
146      DO 430 I=1,NSLOT
147      SKF(I)=SCUR(I,1)
148      SKA(I)=SCUR(I,2)
149      WRITE(6,435)
150      435  FORMAT('11')
151      WRITE(6,440)
152      440  FORMAT(13X,4HSLOT/,11X,9HINTERFACE,6X,2HPO,9X,1HP,10X,1HT,10X,1HU,
153      X10X,2HAP,7X,5HWDOT,8X,2HAB,9X,2HRB,8X,5HDELTA,6X,5HWSLOT/
154      X12X,8HLOCATION,T115,3HTAU/
155      X14X,3HIN,8X,4HPSIA,7X,4HPSIA,6X,6HDEG, 8X,5HFT/SEC,5X,7H50
156      X, IN,4X,6HLB/SEC,5X,7H50, IN,4X,6HIN/SEC,7X,3HIN,6X,6HLB/SEC//)
157      DO 470 I=1,NSLOT
158      WRITE(6,450) SKF(I),POF(I),PSF(I),TSF(I),UF(I),APF(I),DWSLTF(I), A
159      XBSLTF(I),RBSLTF(I),TSLOTF(I),WSLOTF(I)
160      450  FORMAT(1X,8HFORWARD,2X,11(IPE11.4))
161      WRITE(6,460) SKA(I),POA(I),PSA(I),TSA(I),UA(I),APA(I),DWSLTA(I), A
162      XBSLTA(I),RBSLTA(I),TSLOTA(I),WSLOTD(I)
163      460  FORMAT(1X,3AFT,7X,11(IPE11.4)/)
164      470  WRITE(6,480) DWOTS(I)
165      480  FORMAT(1X,*GAS BUILDUP IN SLOT, DW/DT =*,1PE11.4//)
166      IF (IE.EQ.2) GO TO 780
167      500  CALL MODTSB(IE)
168      IF (ICHN.EQ.5) RETURN
169      780  CONTINUE
170      TIME=TIME+DELT
171      RETURN
172      END

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I N D E X

SUBROUTINE IBMOUT(IE)

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ABTOT	-	22CO	44=			
ACCEL	-	12CO				
AFF	-	18CO				
AFHI	-	17CO				
AHH	-	13CO				
AIBCYL	-	23CO	58=	59	86	87WR
AINCHI	-	12CO				
AINCIN	-	4CO				
AINCW	-	21CO				
AIPCYL	-	23CO	52	83	84WR	
AIT	-	22CO				
ATTVAC	-	15CO	40=	42=	43=	
AJBB	-	20CO	59=	68	69WR	
AJBH	-	20CO				
AJBHED	-	13CO	53=	54	77	78WR
AJBHN	-	13CO				
AJBH	-	20CO				
AJBNOZ	-	13CO	54=	54	95	95WR
AJBHED	-	13CO	52	74	75WR	
AJBHN	-	13CO				
AJBNOZ	-	13CO	52	92	93WR	
AJPP	-	18CO	52=	65	66WR	
AK6Y	-	21CO				
AK6YX	-	23CO				
AK6YY	-	23CO				
AKKST	-	21CO				
AL	-	18CO				
ALA	-	4CO				
ALB	-	4CO				
ALE	-	4CO				
ALL	-	18CO				
ALS1	-	4CO				
ALS2	-	4CO				
AMACH	-	12CO				
AMPN	-	21CO				
AMW	-	21CO	33			
AMWG	-	5CO				
ANISO	-	12CO				
ANLOPS	-	12CO				
ANN	-	6CO	37			
ANO	-	4CO				
ANZ	-	6CO				
AOMCYL	-	23CO	50	51		
A01	-	4CO				
A02	-	4CO				
A03	-	4CO				
A04	-	4CO				
A05	-	4CO				
AP	-	19CO				
APA	-	16CO	151WR			
APF	-	16CO	149WR			
APHI	-	12CO				
ASE	-	18CO				
ASEA	-	29CO				
ASEB	-	29CO				

I N D E X

SUBROUTINE IBMOUT(IE)

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ASI	-	18C0									
AT	-	21C0	37								
A1	-	300A	62	71	80	89					
A2	-	300A	65	68	74	77	83	86	92	95	
* BLK005	-	2*									
BRNOUT	-	19C0									
CFO	-	24C0									
CFOL	-	24C0	37								
CFPROP	-	15C0	46AG								
CGCYL	-	50=	80	81WR							
CLOPS	-	24C0									
CM	-	6C0									
* COMA	-	12*									
* COMB	-	13*									
* COMG	-	14*									
* COMI	-	15*									
* COMJ	-	16*									
* COMK	-	17*									
* COML	-	18*									
* CONSTS	-	3*									
CSTAR	-	5C0									
CSTR	-	5C0									
DE	-	6C0									
DEED	-	24C0									
DELF	-	11C0	50	51	53	54	55	56	57		
DELT	-	12C0	42	159							
DELTA	-	21C0									
DELTSS	-	8C0									
DELTST	-	8C0									
DELTTO	-	8C0									
DELZ	-	11C0									
DIS	-	21C0									
DT	-	6C0									
DTINT	-	13C0									
DWDDT	-	14C0									
DWDT5	-	17C0	153WR								
DWDLTA	-	17C0	151WR								
DWDLTF	-	17C0	149WR								
EPI	-	24C0									
F	-	24C0									
* FAMCAL	-	46*									
FINDP	-	15C0	46AG								
FVAC	-	15C0	36	37=	42						
FVACX	-	36=	39=	42							
GAMA	-	5C0									
GAMAG	-	5C0									
GNOT	-	3C0	53	54	58						
HCO	-	11C0	51	53	56						
HE	-	18C0									
HEI	-	20C0									
HSUBMG	-	29C0									
THE VARIABLE- I -IS USED BEFORE IT IS DEFINED											
I	-	132WR	135WR	138WR	14100	142	143	14800	149WR	151WR	153WR
* IBMOUT	-	1*									
ICHN	-	25C0	157								

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I N D E X

SUBROUTINE IHMOOT(IE)

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IE - 1AG 155 156AG
 IFLAG - 28CO
 III - 19CO
 IIJ - 19CO
 IIS - 19CO 106= 109 112WR 121 126WR 129=
 * INPUTG - 5*
 * INPUTI - 6*
 * INPUTL - 7*
 * INPUTM - 8*
 * INPUTO - 9*
 * INPUTT - 10*
 * INPUTU - 11*
 * INPUTV - 12*
 IOUT - 32= 60WR 63WR 66WR 69WR 72WR 75WR 78WR 81WR 84WR 87WR 90WR 93WR
 96WR 100WR 102WR 104WR
 ISI - 19CO
 ISP - 19CO
 J - 107= 109DO 128=
 K - 108DO 110 112WR 116WR 118= 119 120= 122 123 124= 125WR 128
 KDUMP - 11CO
 KMOICG - 9CO
 KPLANE - 9CO
 KRASUB - 20CO
 KXRSUB - 20CO
 L - THE VARIABLE L - IS USED BEFORE IT IS DEFINED
 104WR 112WR 116WR 126WR
 * MODTSB - 156*
 NCASES - 2CO
 NCSCOE - 5CO
 NCSTR - 5CO
 NDISP - 2CO
 NEND - 29CO
 NF - 2CO
 NI - 19CO 35 108DO 118 119 122 134
 NINCPL - 19CO
 NIP1 - 35= 132WR 138WR
 NIP2 - 134= 135WR
 NLEWIS - 2CO
 NPUTAB - 7CO
 NRECON - 2CO
 NSI - 2CO
 NSL01 - 19CO 141DO 148DO
 NSUBMG - 29CO 131
 NTABE - 19CO
 NTME - 19CO
 NWNHAB - 7CO
 * OUTPUT - 47*
 P - 21CO
 PA - 11CO
 * PARMAA - 28*
 * PARMA8 - 29*
 * PARMB - 19*
 * PARMD - 20*
 * PARMF - 21*
 * PARNG - 22*

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1  SUBROUTINE INPT
2  REAL*8 IBN/'IBM DATA'/
3  LOGICAL ERR,LIST1,STATIC
4  COMMON/BLK001/IRKT01,IRKT02,ERR,IN
5  COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE
6  COMMON/BLK021/ TSREC,TEREC,CGBAR,PNSBAR,TWER,PIW,CSCOE(3),LIST1,
    $ STATIC
7  COMMON/BLK026/ N1BFLG
8  COMMON/CONST5/GNOT,PI,PI02,RADIAN
9  COMMON/INPUT1/AINCIN(18),ANO(18),RF(18),TAUW(18),R2(18),
    1  R3(18),R4(18),R5(18),R6(18),R7(18),R8(18),
    2  ALS1(18),ALS2(18),ALA(18),ALB(18),ALE(18),A01(18),
    3  A02(18),A03(18),A04(18),A05(18)
10 COMMON/INPUT2/TH0(18),TSLVR(18)
11 COMMON/INPUT3/GECON(45,18)
12 COMMON/INPUT4/NGEO(18),APOR(18),TAUPL(50,18),ALPPL(50,18),
    1  AKGYP(50,18),TAUHD(50),ABHD(50),PMOHD(50),
    2  RMOHD(50),XCGHD(50),TAUN(50),ABN(50),PMOIN(50),
    3  RMOIN(50),XCGN(50),NGEHD,NGEOMN
13 COMMON/INPUTA/HTAOE,DH,BH,AOHM,RIG,HHR
14 COMMON/INPUTB/AONM,BN,DNI
15 COMMON/INPUTC/AK,AKK,DLRF,DRVRF
16 COMMON/INPUTD/AKRH,AKRN,RBFLAG
17 COMMON/INPUTE/AKG(5),AKU(5),AKR(39),AKSLOT(2),VA<R,TIMAKR(25),
    1  TBLAKR(25),NAKEND
18 COMMON/INPUTF/NPH,PHST(70),TIMEPH(70),NAKHST,TAUAKR(30),
    1  AKRTAU(30),NTAUTO,PCTAB
19 COMMON/INPUTG/CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
    1  AMWG(20),TCOMR(20),NCSCOE
20 COMMON/INPUTH/AINCPL,VCHINP,VCNINP
21 COMMON/INPUTI/AN2,CM,DE,DT,ANN
22 COMMON/INPUTJ/NDI,TIMEDT(25),TDELOT(25),ERBAR,EREXP,PONBAR
23 COMMON/INPUTK/NC4,TBLCH(50),TIMECH(50),TIMAX,CKDUMP(80),NPA,
    1  TIMEPA(50),TBLPA(50)
24 COMMON/INPUTL/PRTFLG,NWRTAB,NPUTAB
25 COMMON/INPUTM/STFLAG,STOYST,DELTST,DELTSS,DELTTO,
26 COMMON/INPUTN/ATST,PST,TST,TIMPT1,TIMPT2,DELTSP,ANITW
27 COMMON/INPUTO/KPLANE,KMOICG
28 COMMON/INPUTP/NEPS,TIMEPS(50),EPCA(50),EPCN(50),NACCEL,ACCELT(50),
    1  TIMEAC(50)
29 COMMON/INPUTQ/CRP,CRT,CRW
30 COMMON/INPUTR/WFACT,RHOTOL,WFTOL
31 COMMON/INPUTS/UTAU(18),DTAUW(18)
32 COMMON/INPUTT/SB(18),SLTB RN(18),SA(18)
33 COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KDUMP(72)
34 COMMON/INPUTV/ VFNOA,VFNOB,VCNINA,VCNINB
35 COMMON/INPUTW/ TAUHNA,TAUMNB
36 COMMON/DUMYV/GEORUN
37 COMMON/WORKRH/RH1(5),H42,ACG,HHW,VFH0,VCH,ANK(10)
38 COMMON/WORKRN/RN1(8),VFND,VCN,ACK(10)
39 COMMON/PARMB/AP,PMIN,PMAX,WDOT,I1I,I1J,WDOTD,NSLOT,NTABE,NTME,
    1  TAUTO,TOFLAG,NINCPL,BRNOUT,IIS,I1I,IS2,N1,SCUR(18,2)
40 COMMON/PARMAA/TO,IFLAG
41 COMMON/PARMAB/ HSUBMG,NSUBMG,NEND,ASEA,ASEB,SUMDVA,SUMDVH
42 COMMON/PARMAC/ HEA,HEB,AEEA,AEEB,DVA,DVB,HEIA,HEIB,AWEA,AWEH,DELH

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43      COMMON/PAHMA/ PMOINA(50),PMOINB(50),RMOINA(50),RMOINB(50),
      $ XCGNA(50),XCGNB(50),ABNA(50),ABNB(50)
44      COMMON/PAHMA/ TXSUB(20),TRSUB(20),NPSUB
45      COMMON/PAHMA/ VNOZSB,THETEX,SIPATC,NCUNT
46      COMMON/PAHMA/ TA1B(50),TA2B(50),TAUNB(50)
47      COMMON/PAHMA/ A1H,A2B
48      NAMELIST/IDISP/DELF,AKR,AKSLOT,ERBAR,CSTAR,CSTR,DT,DE
49      NAMELIST/IDDATA/
      C MOTOR CASE AND PROPELLANT GRAIN GEOMETRY FACTORS:
50      $HCO,AINCIN,SA,SB,DEL2,AND,RF,ALS1,ALS2,TAUW,A01,A02,A03,A04,A05,R2
      $,R3,R4,R5,R6,R7,R8,ALA,ALB,ALE,THO,TSLVR,DTAU,DTAUW,BH,DH1,AOHM,
      $BTADE,RIG,AK,DRVRF,AKK,BY,DNI,ADNM,OLRF,
      ***** S Y N T A X   E R R O R *****
      C PROPELLANT PROPERTIES AND BURNING RATE MODEL PARAMETERS:
51      $AKG,HHR,AKU,AKR,AKSLOT,SLTRN,NPH, AINCPL,RBFLAG,AKKH,AKRN,
      $PHSF,TIMEPH,VAKRST,TAJAK4,AKRTAU,GAMA,R,DELF,CSTAR,TD,NCST3,PRESS,
      $ NAKR,TIMAKR,TBLAKR,NAKEND,NTAUTO,
      $TCOMB,AMWG,GAMAG,CSTR,NCSCOE,
      ***** S Y N T A X   E R R O R *****
      C NON-STEADY FLOW,STEADY-STATE, AND PROGRAM TIME CONTROL PARAMETERS:
52      $STFLAG,STDYST,DELTST,DELTSS,DELTTO,TIMAX,TST,PST,AITST,ANITW,
      $TIMPT1,TIMPT2,DELTSP,
      ***** S Y N T A X   E R R O R *****
      C NOZZLE PARAMETERS:
53      $ AN2,CM,DE,DT,ANN,PA,NDT,TIMEDT,TIDELDT,NPA,TIMEPA,TBLPA,
      $ ERBAR,EREXP,PONBAR,DELH, TA1B,TA2B,TAUNB,
      $ NCM,THLCM,TIMECH,MSUBMG,NSUBMG,TAUMNA,TAUMNB,
      $ TXSUB,TKSUB,NPSUB,THETEX,SIPATC,NCUNT,
      ***** S Y N T A X   E R R O R *****
      C GEOMETRY TABLE PARAMETERS:
54      $ NWRTAB,NPUTAB,KPLANE,VCHINP,VCNINP,VFHO,VFNO,NGEOHD,NGEOMN,
      $ APOHT,TAJHD,ARHD,PMOIND,RMOIND,XCGHD,TAUN,ABN,PMOIN,RMOIN,
      $XCGN,TAUPL,ALPPL,AKGYP,GEOCON,NGEO,ABNA,ABNB,PMOINA,PMOINB,
      $RMOINA,RMOINB,XCGNA,XCGNB,VFNOA,VFNOB,VCNINA,VCNINB,
      ***** S Y N T A X   E R R O R *****
      C MISCELLANEOUS INPUTS:
55      $PRIFLG,KMOICG,PHI,CRP,CRT,CRW,NEPS,PCIAH,TIMEPS,EPCA,EPCN,VACCEL,
      $ACCELT,TIMEAC,CKDUMP,KDUMP,WFACT,RHOTOL,WFTOL,GFORUN
      ***** S Y N T A X   E R R O R *****
56      NIBOUT=20
57      IF(NDISP.GT.0) REWIND 25
58      CALL DATLOC(IDN)
59      IF(NCASE.GT.0 .AND. NIBFLG.GT.0) GO TO 120
60      8 READ(IN,IDDATA,END=100)
61      IF(NDISP.GT.0) READ(25,IDISP)
62      DO 20 I=1,13
63      THO(I)=THO(I)/57.29578
      C IF THETA=ZERO VALUES ARE INPUT, M.O.I. CALCULATIONS ARE SUPPRESSED
64      IF(THO(I).GT.0.0)KMOICG=1.0
65      20 CONTINUE
66      IF(KPLANE.NE.0) GO TO 22
67      WRITE(6,21) KPLANE
68      21 FORMAT('0ERROR IN INPT *** KPLANE= ',I3)
69      STOP
70      22 IF(NCSCOE.GT.0) CSCOE(1)=0.0

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71      IF(NCSTR.GT.0) GO TO 25
72      IF(TO.EQ.0.0) TO=CSTAR**2/GAMA*(2./(GAMA+1.))**
      $((GAMA+1.)/(GAMA-1.))/(32.17405*R)
73      IF(CSTAR.EQ.0.0 .AND. CSCOEFF(1).EQ.0.0)
      $          CSTAR=SQRT(32.17405*R*TO/(GAMA*(2./(GAMA+1.))**
      $((GAMA+1.)/(GAMA-1.))))
      C INITIALIZE SLOT INTERFACE LOCATIONS(IF ANY INTERFACE LOCATION IS ZERO.
      C EXCEPT SA(1), THEN RESET TO THE UNATTAINABLE VALUE 1.0E37)
74      25 IF(SB(1).EQ.0.0)GO TO 40
75          SCUR(1,1)=SA(1)
76          SCUR(1,2)=SB(1)
77          DO 30 I=2,18
78              IF(SA(I).EQ.0.0)SA(I)=1.0E37
79              IF(SB(I).EQ.0.0)SB(I)=1.0E37
80              SCUR(I,1)=SA(I)
81              30 SCUR(I,2)=SB(I)
82          GO TO 60
83      40 DO 50 I=1,18
84          SA(I)=1.0E37
85          SB(I)=1.0E37
86          SCUR(I,1)=1.0E37
87      50 SCUR(I,2)=1.0E37
88      60 CONTINUE
      C SET CONVERGENCE CRITERIA IF THEY HAVE NOT BEEN INPUT
89          IF(CRP.EQ.0.0)CRP=0.001
90          IF(CRT.EQ.0.0)CRT=0.001
91          IF(CRW.EQ.0.0)CRW=0.001
92          RETURN
93      100 WRITE(6,110)
94      110 FORMAT(5(/,'*0END OF JOB*')
95          STOP
96      120 REWIND NIBOUT
97          READ(NIBOUT,18DATA)
98          GO TO 8
99          END

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I N D E X

SUBROUTINE INPT

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SYMBOL	-----	REFERENCES	-----
B	-	60*	94
20	-	6200	65*
21	-	67WR	68*
22	-	65	70*
25	-	71	74*
30	-	7700	81*
40	-	74	83*
50	-	8300	87*
60	-	82	88*
100	-	60RD	93*
110	-	93WR	94*
120	-	59	96*
ABHD	-	1200	54
ABN	-	1200	54
ABNA	-	4300	54
ABNB	-	4300	54
ACCELT	-	2800	55
ACG	-	3700	
ACK	-	3800	
AEEA	-	4200	
AEEB	-	4200	
AINCIN	-	900	50
AINCPL	-	2000	51
AITST	-	2600	52
AK	-	1500	50
AKG	-	1700	51..
AKGYP	-	1200	54
AKK	-	1500	50
AKR	-	1700	48NM 51
AKRH	-	1500	51
AKRN	-	1600	51
AKRTAU	-	1800	51
AKSLOT	-	1700	48NM 51
AKU	-	1700	51
ALA	-	900	50
ALB	-	900	50
ALE	-	900	50
ALPPL	-	1200	54
ALS1	-	900	50
ALS2	-	900	50
AMWG	-	1900	51
ANITW	-	2600	52
ANK	-	3700	
ANN	-	2100	53
ANO	-	900	50
AN2	-	2100	53..
AOHH	-	1300	50
AONH	-	1400	50
A01	-	900	50
A02	-	900	50
A03	-	900	50
A04	-	900	50
A05	-	900	50

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	AP	"	39C0	"				
	APORT	"	12C0	54				
	ASEA	"	41C0					
	ASEB	"	41C0					
	AWEA	"	42C0					
	AWEB	"	42C0					
	A1B	"	47C0					
	A2B	"	47C0					
	BH	"	13C0	50				
*	BLK001	"	4*					
*	BLK005	"	5*					
*	BLK021	"	6*					
*	BLK026	"	7*					
	BN	"	14C0	50				
	BRNOUT	"	39C0					
	BTAOE	"	13C0	50				
	CKDUMP	"	23C0	55				
	CM	"	21C0	53				
*	CONSTS	"	8*					
	CRP	"	29C0	55	89			
	CRT	"	29C0	55	99			
	CRW	"	29C0	55	91			
	CSBAR	"	6C0					
	CSCDEF	"	6C0	70=	73			
	CSTAR	"	19C0	48NM	51	72	73	
	CSTR	"	19C0	48NM	51			
*	DATLOC	"	58*					
	DE	"	21C0	48NM	53			
	DELF	"	33C0	48NM	51			
	DELH	"	42C0	53				
	DELTSP	"	26C0	52				
	DELTSS	"	25C0	52				
	DELTST	"	25C0	52				
	DELTTO	"	25C0	52				
	DELZ	"	33C0	50				
	UH1	"	13C0	50				
	ULRF	"	15C0	50				
	DN1	"	14C0	50				
	URVRF	"	15C0	50				
	DT	"	21C0	48NM	53			
	DTAU	"	31C0	50				
	DTAOW	"	31C0	50				
*	DUMYV	"	35*					
	DVA	"	42C0					
	DVB	"	42C0					
	EPCA	"	28C0	55				
	EPCN	"	28C0	55				
	ERBAR	"	22C0	48NM	53			
	EREXP	"	22C0	53				
	ERR	"	3LG	4C0				
	GAMA	"	19C0	51	72	73		
	GAMAG	"	19C0	51				
	GEOCON	"	11C0	54				
	GEORUN	"	36C0	55				
	GNOT	"	8C0					

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SUBROUTINE INPT

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HCO	-	33CO	50,,													
HEA	-	42CO														
HEB	-	42CO														
HEIA	-	42CO														
HEIB	-	42CO														
HHR	-	13CO	51													
HHW	-	37CO														
HH2	-	37CO														
HSUBMG	-	41CO	53													
I	-	6200	63	64	7700	78	79	80	81	8300	84	85	86	87		
ISDATA	-	49NM	60RD	97RD												
IBN	-	2RL	58AG													
IDISP	-	48NM	61RD													
IFLAG	-	40CO														
III	-	39CO														
IIJ	-	39CO														
IIS	-	39CO														
IN	-	4CO	60RD													
* INPT	-	1*														
* INPUTA	-	13*														
* INPUTB	-	14*														
* INPUTC	-	15*														
* INPUTD	-	16*														
* INPUTE	-	17*														
* INPUTF	-	18*														
* INPUTG	-	19*														
* INPUTH	-	20*														
* INPUTI	-	21*														
* INPUTJ	-	22*														
* INPUTK	-	23*														
* INPUTL	-	24*														
* INPUTM	-	25*														
* INPUTN	-	26*														
* INPUTO	-	27*														
* INPUTP	-	28*														
* INPUTQ	-	29*														
* INPUTR	-	30*														
* INPUTS	-	31*														
* INPUTT	-	32*														
* INPUTU	-	33*														
* INPUTV	-	34*														
* INPUTW	-	35*														
* INPUT1	-	9*														
* INPUT2	-	10*														
* INPUT3	-	11*														
* INPUT4	-	12*														
IRKT01	-	4CO														
IRKT02	-	4CO														
IS1	-	39CO														
IS2	-	39CO														
KDUMP	-	33CO	55													
KMOICG	-	27CO	55	64=												
KPLANE	-	27CO	54	66	67WR											
LIST1	-	3LG	600													
NACCEL	-	28CO	55													

I N D E X

SUBROUTINE INPT

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NAKEND	-	17C0	51	
NAKR	-	17C0	51	
NAKRST	-	18C0	51	
NCASE	-	5C0	59	
NCASES	-	5C0		
NCM	-	23C0	53	
NCONT	-	45C0	53	
NCSCOE	-	19C0	51	70
NCSTR	-	19C0	51	71
NDISP	-	5C0	57	61
NDT	-	22C0	53	
NEND	-	41C0		
NEPS	-	28C0	55	
NF	-	5C0		
NGEO	-	12C0	54	
NGEOHD	-	12C0	54	
NGEOMN	-	12C0	54	
NI	-	39C0		
NIBFLG	-	7C0	59	
NIHOUT	-	56=	96	97RD
NINCP	-	39C0		
NLEWIS	-	5C0		
NPA	-	23C0	53	
NPH	-	18C0	51	
NPSUB	-	44C0	53	
NPUTAB	-	24C0	54	
NRECON	-	5C0		
NSI	-	5C0		
NSLOT	-	39C0		
NSUBMG	-	41C0	53	
NTAB	-	39C0		
NTAUTO	-	18C0	51	
NIME	-	39C0		
NWRTAB	-	24C0	54..	
PA	-	33C0	53	
* PARM	-	40*		
* PARM	-	41*		
* PARM	-	42*		
* PARM	-	43*		
* PARM	-	44*		
* PARM	-	45*		
* PARM	-	46*		
* PARM	-	47*		
* PARM	-	39*		
PCTAB	-	18C0	55	
PHI	-	33C0	55	
PHST	-	18C0	51	
PI	-	8C0		
PI02	-	8C0		
PITW	-	6C0		
PMAX	-	39C0		
PMIN	-	39C0		
PMOHD	-	12C0	54	
PMOIN	-	12C0	54	
PMOINA	-	43C0	54	

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SUBROUTINE INPT

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THETEX	-	4500	53		
THO	-	1000	50	63=	64
TIMAKR	-	1700	51		
TIMAX	-	2300	52		
TIMEAC	-	2800	55		
TIMECM	-	2300	53		
TIMEDT	-	2200	53		
TIMEPA	-	2300	53		
TIMEPH	-	1800	51		
TIMEPS	-	2800	55		
TIMPT1	-	2600	52		
TIMPT2	-	2600	52		
TO	-	4000	51	72	73
TOFLAG	-	3900			
TRSUB	-	4400	53		
TSLVR	-	1000	50		
TSHEC	-	600			
TST	-	2600	52		
TWEB	-	600			
TXSUB	-	4400	53		
VCH	-	3700			
VCHINP	-	2000	54		
VCN	-	3800			
VCNINA	-	3400	54		
VCNINH	-	3400	54		
VCNINP	-	2000	54		
VFHO	-	3700	54		
VFN0	-	3800	54		
VFN0A	-	3400	54		
VFN0B	-	3400	54		
VNOZSB	-	4500			
WDOT	-	3900			
WDOTD	-	3900			
WFACT	-	3000	55		
WFTOL	-	3000	55		
* WORKRH	-	37*			
* WORKRN	-	38*			
XCGHD	-	1200	54		
XCGN	-	1200	54		
XCGNA	-	4300	54		
XCGNB	-	4300	54		

1	SUBROUTINE LBSUB	70170
	CC	70220
C	SUBROUTINE LBSUB DETERMINES THE LENGTH (B) OF THE Y INTERCEPT	70240
C	PRODUCED BY THE INTERSECTION OF THE LINE Y=0 AND THE LINE NORMAL	70250
C	TO THE ELLIPSE AT P0 (SECTION 5.2.1.2).	70260
	CC	70280
2	COMMON/PARMH/B1E,BDE,AA4N,RX,RXX,AS11,BELLRI,ROPE4,A1E,YPI,ZP1,	
	1 ARCO,ARCI,ROE1,ALITIL,ZI,AIG,THRI,T-HRO,AOE	
3	IF(YPI)20,10,20	70300
4	10 ALITIL=0.	70310
5	GO TO 30	70320
6	20 ALITIL=(ZP1-YPI*TAN(ARCI))/TAN(ARCI)	70330
7	30 RETURN	70340
8	END	

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I N D E X

SUBROUTINE LBSUB

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SYMBOL	-----	REFERENCES	-----
10	-	3	4*
20	-	3	6*
30	-	5	7*
AANN	-	2C0	
AIG	-	2C0	
ALITTL	-	2C0	4= 6=
AOE	-	2C0	
ARCO	-	2C0	
ARC1	-	2C0	6
AS11	-	2C0	
A1E	-	2C0	
BOE	-	2C0	
BX	-	2C0	
B1E	-	2C0	
DELLRI	-	2C0	
* LBSUB	-	1*	
* PARMH	-	2*	
* RETURN	-	7*	
ROE1	-	2C0	
ROPE4	-	2C0	
RXX	-	2C0	
* TAN	-	6	
IHR1	-	2C0	
IHR0	-	2C0	
YP1	-	2C0	3 6
ZI	-	2C0	
ZP1	-	2C0	6

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```
1      SUBROUTINE LINK1
2      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE      ALL
3      COMMON/INPUTL/PRTFLG,NWRTAB,NPUTAB
4      COMMON/PARMS/ICMN
5      4 CALL INPT
6      IF(NRECON.GT.0) CALL INTREC
7      ICMN=1
8      5 GO TO (6,7,8,9,10,15),ICMN
9      6 CALL MNCHN1
10     GO TO 5
11     7 CALL MNCHN2
12     GO TO 5
13     8 CALL MNCHN3
14     GO TO 5
15     9 IF((NPUTAB.GT.0).OR.(NWRTAB.GT.0)) CALL PCHWRT
16     RETURN
17     10 WRITE(6,12)
18     12 FORMAT('ERROR IN IBM MODULE, IN LINK1')
19     STOP
20     15 RETURN
21     END
```

SYMBOL	-----	REFERENCES	-----
4	-	5*	
5	-	8*	10 12 14
6	-	8	9*
7	-	8	11*
8	-	8	13*
9	-	8	15*
10	-	8	17*
12	-	17WR	18*
15	-	8	20*
* BLK005	-	2*	
* ICHN	-	4CU	7= 8
* INPT	-	5*	
* INPUTL	-	3*	
* INTREC	-	6*	
* LINK1	-	1*	
* MNCHN1	-	9*	
* MNCHN2	-	11*	
* MNCHN3	-	13*	
* NCASE	-	2CU	
* NCASES	-	2CU	
* NDISP	-	2CU	
* NF	-	2CU	
* NLEWIS	-	2CU	
* NPUTAB	-	3CU	15
* NRECON	-	2CU	6
* NSI	-	2CU	
* NWRTAB	-	3CU	15
* PARMS	-	4*	
* PCHWRT	-	15*	
* PRIFLG	-	3CU	
* RETURN	-	16*	20*
* STOP	-	19*	

```
1      SUBROUTINE LINK2
2      COMMON/DUMYV/GEORUN
3      COMMON/PARMS/ICHN
4      COMMON/PARMAH/ VNOZSB,THETEX,SIRATC,NCONT
5      IF(NCONT.GT.0) CALL NSCE(1)
6      IF(ICHN.EQ.5) GO TO 35
7      IF(GEORUN.GT.0.0) RETURN
8      CALL MNCHN4
9      20 IF(ICHN.NE.5) RETURN
10     WRITE(6,30)
11     30 FORMAT('ERROR IN IBM MODULE, IN LINK2')
12     STOP
13     35 WRITE(6,35)
14     36 FORMAT('ERROR IN IBM MODULE/NSCE, FROM LINK2')
15     STOP
16     END
```

I N D E X

SUBROUTINE LINK2

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SYMBOL	-----	REFERENCES	-----
20	-	9*	
30	-	10WR	11*
35	-	6	13*
36	-	13WR	14*
* DUMYV	-	2*	
GEORUN	-	2CD	7
ICHN	-	3CD	6 9
* LINK2	-	1*	
* MNCHN4	-	8*	
NCONT	-	4CD	5
* NSCE	-	5*	
* PARMH	-	4*	
* PARMS	-	3*	
* RETURN	-	7*	9*
SIRATC	-	4CD	
* STOP	-	12*	15*
THETEX	-	4CD	
VNOZCB	-	4CD	

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I N D E X

SUBROUTINE LOOKUP

PAGE 167

38	110	FORMAT(38H06GEOMETRY TABLE LOOK-UP FAILURE - PLN 12)	90470
39		GO TO 160	90490
	C	CALCULATE INTERPOLATION FACTOR	90500
40	120	ALPRP(I)=ALPPL(ITAU,I)	
41		RGYP(I)=AKGYP(ITAU,I)	
42		GO TO 160	90530
43	130	FACTOR=(ITAU-TAUPL(ITAU-1,I))/(TAUPL(ITAU,I)-TAUPL(ITAU-1,I))	
	C	COMPUTE PERIMETER LENGTH FOR THIS PLANE	90560
44		ALPRP(I)=ALPPL(ITAU-1,I)+FACTOR*(ALPPL(ITAU,I)-ALPPL(ITAU-1,I))	
	C	IF KMOICG IS ZERO COMPUTE RADIUS OF GYRATION.	
45		IF(KMOICG)160,150,160	
46	150	RGYP(I)=AKGYP(ITAU-1,I)+FACTOR*(AKGYP(ITAU,I)-AKGYP(ITAU-1,I))	
	C		90630
	C	COMPUTE END-SECTION VALUES IF APPROPRIATE	90640
	C		90650
47	160	IF(I-1)280,170,280	90680
	C		90690
	C	CALCULATE HEAD-END INTERPOLATION FACTOR	90700
	C		90710
48	170	LH1=LH	
49		DO 200 J=LH1,NGEOMD	
50		IF(TAU-TMHD)190,190,180	90740
51	180	AHH=0.0	
52		AJPHED=0.0	
53		AJBHED=0.0	
54		XBH=0.0	
55		GO TO 280	90790
56	190	IF(TAUHD(LH)-TAU)200,230,240	
57	200	LH=LH+1	90810
	C	IF DO-LOOP IS EVER SATISFIED THE TABLE HAS BEEN OVERRUN	90840
58		WRITE(6,220)	90850
59	220	FORMAT(38H06GEOMETRY TABLE LOOK-UP FAILURE - HED)	90860
60		GO TO 280	90940
61	230	AHH=ABHD(LH)	
62		AJPHED=PMOIND(LH)	
63		AJBHED=RMOIND(LH)	
64		XBH=XCGHD(LH)	
65		GO TO 390	90930
66	240	FACTOR=(TAU-TAUHD(LH-1))/(TAUHD(LH)-TAUHD(LH-1))	
	C		90960
	C	COMPUTE HEAD-END BURN AREA	90970
	C		90980
67		AHH = ABHD(LH-1)+FACTOR*(ABHD(LH)-ABHD(LH-1))	
68		IF(KMOICG)280,260,280	
69	260	AJPHED=PMOIND(LH-1)+FACTOR*(PMOIND(LH)-PMOIND(LH-1))	
70		AJBHED=RMOIND(LH-1)+FACTOR*(RMOIND(LH)-RMOIND(LH-1))	
71		XBH=XCGHD(LH-1)+FACTOR*(XCGHD(LH)-XCGHD(LH-1))	
72	280	IF(I-KPLANE)390,290,390	91060
	C		91070
	C	CALCULATE NOZZLE INTERPOLATION FACTOR	91080
	C		91090
73	290	LN1=LN	
74		IF(NSUBMG.GT.0) GO TO 3800	
75		DO 320 J=LN1,NGEOMN	
76		IF(TAU-TMN)310,310,300	91120

```

77      300 AAN=0.0
78      AJPNOZ=0.0
79      AJBNOZ=0.0
80      XBN=0.0
81      GO TO 390
82      310 IF (TAUN(LN)-TAU) 320,350,360
83      320 LN=LN+1
C      IF DO-LOOP IS EVER SATISFIED THE TABLE HAS BEEN OVERRUN
84      WRITE(6,340)
85      340 FORMAT(380GEOMETRY TABLE LOOK-UP FAILURE - NOX )
86      GO TO 390
87      350 AAN=ABN(LN)
88      AJPNOZ=PMOIN(LN)
89      AJBNOZ=RMOIN(LN)
90      XBN=XCGN(LN)
91      GO TO 390
92      360 FACTOR=(TAU-TAUN(LN-1))/(TAUN(LN)-TAUN(LN-1))
93      AAN = ABN(LN-1)*FACTOR*(ABN(LN)-ABN(LN-1))
C      IF APPROPRIATE CALCULATE MOMENTS OF INERTIA AND CENTER OF GRAVITY
94      IF (KMOICG) 390,380,390
95      380 AJPNOZ = PMOIN(LN-1)*FACTOR*(PMOIN(LN)-PMOIN(LN-1))
96      AJBNOZ = RMOIN(LN-1)*FACTOR*(RMOIN(LN)-RMOIN(LN-1))
97      XBN = XCGN(LN-1)*FACTOR*(XCGN(LN)-XCGN(LN-1))
98      GO TO 390
99      3800 DO 3870 K=1,2
100      LN=LN1
101      TAU=TAUZ(NI*K)
102      IF (K.EQ.2) GO TO 3810
103      IF (TAU-(TAUMNA-0.0001)) 3410,3805,3805
104      3805 AANA=0.0
105      AJPNZ=0.0
106      AJBNZA=0.0
107      XBNA=0.0
108      GO TO 3670
109      3810 DO 3820 J=LN1,NGEOMN
110      IF (TAUN(LN)-TAU) 3820,3850,3860
111      3820 LN=LN+1
C      IF DO-LOOP IS EVER SATISFIED THE TABLE HAS BEEN OVERRUN
112      WRITE(6,3840)
113      3840 FORMAT(380GEOMETRY TABLE LOOK-UP FAILURE -NOX - STATEMENT 3820 IN L
        $OOKUP)
114      GO TO 3900
115      3850 IF (K.EQ.2) GO TO 3855
116      AANA=ABNA(LN)
117      IF (KMOICG.NE.0) GO TO 3870
118      AJPNZ=PMOINA(LN)
119      AJBNZA=RMOINA(LN)
120      XBNA = XCGNA(LN)
121      GO TO 3870
122      3855 AANB = ABNB(LN)
123      IF (KMOICG.NE.0) GO TO 3870
124      AJPNZB = PMOINB(LN)
125      AJBNZB = RMOINB(LN)
126      XBNB = XCGNB(LN)
127      GO TO 3870

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91170

91190

91220

91230

91240

91260

91310

91350

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128      3860 FACTOR=(TAU-TAUN(LN-1))/(TAUN(LN)-TAUN(LN-1))
129      IF (K.EQ.1) AANA=ABNA(LN-1)+FACTOR*(ABNA(LN)-ABNA(LN-1))
130      IF (K.EQ.2) AANB=ABNB(LN-1)+FACTOR*(ABNB(LN)-ABNB(LN-1))
131      C      IF APPROPRIATE CALCULATE MOMENTS OF INERTIA AND CENTER OF GRAVITY
132      IF (KMOICG.NE.0) GO TO 3870
133      IF (K.EQ.2) GO TO 3865
134      AJPNZ=PMOINA(LN-1)+FACTOR*(PMOINA(LN)-PMOINA(LN-1))
135      AJBNZ=PMOINB(LN-1)+FACTOR*(PMOINB(LN)-PMOINB(LN-1))
136      XRNA =XCGNA(LN-1)+FACTOR*(XCGNA(LN)-XCGNA(LN-1))
137      GO TO 3870
138      3865 AJPNZB=PMOINB(LN-1)+FACTOR*(PMOINB(LN)-PMOINB(LN-1))
139      AJBNZB=PMOINB(LN-1)+FACTOR*(PMOINB(LN)-PMOINB(LN-1))
140      XBNB= XCGNB(LN-1)+FACTOR*(XCGNB(LN)-XCGNB(LN-1))
141      CONTINUE
142      3880 AAN = AANA + AANB
143      IF (KMOICG.NE.0) GO TO 3900
144      AJPNOZ = AJPNZ + AJPNZB
145      AJBNOZ = AJBNZ + AJBNZB
146      XBN = (XRNA*VFNA + XBNB*VFNB)/VFN
147      3900 TAU=TAUZ(NI+2)
148      LN=LN1
149      DO 3920 J=LN1,NGEOMN
150      IF (TAUNB(LN)-TAU) 3920,3950,3960
151      3920 LN=LN+1
152      WRITE(6,J940)
153      3940 FORMAT('06GEOMETRY TABLE LOOK-UP FAILURE - STATEMENT 3920 IN LOOKUP
154      3950 A1B=TA1B(LN)
155      A2B=TA2B(LN)
156      GO TO 390
157      3960 FACTOR=(TAU-TAUNB(LN-1))/(TAUNB(LN)-TAUNB(LN-1))
158      A1B = TA1B(LN-1)+FACTOR*(TA1B(LN)-TA1B(LN-1))
159      A2B = TA2B(LN-1)+FACTOR*(TA2B(LN)-TA2B(LN-1))
160      390 CONTINUE
161      400 RETURN
162      END

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91400
91410

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I N D E X

SUBROUTINE LOOKUP

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ABTOT	-	10C0												
AFRPL	-	11C0												
AHH	-	7C0	51=	61=	67=									
AIT	-	10C0												
AJBHED	-	7C0	53=	63=	70=									
AJBHN	-	7C0												
AJBNOZ	-	7C0	79=	89=	96=	144=								
AJBNA	-	15C0	106=	119=	134=	144=								
AJBNAZ	-	15C0	125=	138=	144=									
AJPHED	-	7C0	52=	62=	69=									
AJPHN	-	7C0												
AJPNQZ	-	7C0	78=	88=	95=	143=								
AJPNZA	-	15C0	105=	118=	133=	143=								
AJPNZB	-	15C0	124=	137=	143=									
AKGYP	-	3C0	41	46										
ALPPL	-	3C0	40	44										
ALPRP	-	11C0	31=	40=	44=									
AP	-	9C0												
APORT	-	3C0												
ASEA	-	12C0												
ASEB	-	12C0												
A1B	-	17C0	154=	158=										
A2B	-	17C0	155=	159=										
BRNOUT	-	9C0												
COMB	-	7*												
COMG	-	8*												
UTINT	-	7C0												
DUMYW	-	6*												
DWDOT	-	8C0												
FACTOR	-	43=	44	46	66=	67	69	70	71	92=	93	95	96	97
	-	128=	129	130	133	134	135	137	138	139	157=	158	159	
GEOCON	-	2C0	20	23=	25	30								
HSUBMG	-	12C0												
I	-	2100	22	23	2600	28	29	30	31	32	34	37WR	40	41
	-	43	44	46	47	72								
III	-	9C0												
IIJ	-	9C0												
IIS	-	9C0												
INPUT0	-	4*												
INPUTW	-	5*												
INPUT3	-	2*												
INPUT4	-	3*												
IS1	-	9C0												
IS2	-	9C0												
ITAU	-	27=	34	35=	36	40	41	43	44	46				
J	-	4900	7500	10900	14800									
K	-	9900	101	102	115	129	130	132						
KMOICG	-	4C0	45	68	94	117	123	131	142					
KPLANE	-	4C0	2100	25	2600	72								
LH	-	18=	48	56	57=	61	62	63	64	66	67	69	70	71
LH1	-	48=	4900											
LN	-	19=	73	82	83=	87	88	89	90	92	93	95	96	97
	-	100=	110	111=	116	118	119	120	122	124	125	126	128	129
	-	130	133	134	135	137	138	139	147=	149	150=	154	155	157
	-	158	159											

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SUBROUTINE LOOKUP

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TAUZ	-	800	101	146		
TAUZTO	-	800				
TAIB	-	1600	154	158		
TA2B	-	1600	155	159		
THHD	-	24=	50			
THN	-	25=	76			
TOFLAG	-	900				
VCNA	-	1400				
VCNB	-	1400				
VEH	-	1000				
VF	-	800				
VFH	-	1000				
VFINI	-	1000				
VFN	-	1000	145			
VFNA	-	1400	145			
VFNH	-	1400	145			
VIS	-	1000				
VP	-	800				
WDOT	-	900				
WDOTD	-	900				
XBH	-	700	54=	64=	71=	
XBN	-	700	80=	90=	97=	145=
XBNA	-	1500	107=	120=	135=	145
XBNB	-	1500	126=	139=	145	
XCGHD	-	300	64	71		
XCGN	-	300	90	97		
XCGNA	-	1300	120	135		
XCGNB	-	1300	126	139		

```

1      SUBROUTINE LPDAPS
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      SUBROUTINE LPDAPS SETS UP THE CORRECT VARIABLES TO DETERMINE THE
C      PERIMETER LENGTH, ALP, AND THE CROSS-SECTIONAL FUEL AREA, AFF, OF
C      THE PROPELLANT TIPS IN SUBROUTINE AFPSUB FOR THE CYLINDRICAL
C      SECTION REFERENCE PLANES (SECTION 5.1.1).
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
2      COMMON/CONSTS/GNOT,PI,PI02,RADIAN
3      COMMON/INPUT0/KPLANE,KMOICG
4      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X05,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3          TH3,TH4,B71M,B72M,B91M,B92M
5      COMMON/WORKA/AJNC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALB,ALE,AW(5)
6      COMMON/COMB/AHH,AJPHN,AJBHN,TAUA0,AJPHED,AJRHED,AJPN07,AJBVOZ,
1          XBH,XBN,DTINT
7      COMMON/COMG/TAUZ(101),R9Z(101),TAUZT0(101),RBZT0(101),PD(101),
1          TAUWDP(101),RB,VF,DWDOT,VP
8      COMMON/COMO/THSLV,HSLVR,THSLVV,ASLVR,ANO,PFHI,ALPX,APX,
1          R3HI,ALPY,APY,VSLVR
9      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,
1          RAO,ALL,AJPP,AST
10     COMMON/COMY/AV1,AV2,TV2,TV4,TV5,TV6,TV7,ALVA,ALV3,ALVC,RV2,RV3,
1          RV4,XV7,DELL3,HV1
11     COMMON/COMZ/AV3,BV1M,BV2M,THV,RV5,RV7,HV1,HV2,RS1,VHV
12     COMMON/PARMA/AFP,AL7,AL8,TAUTOV,BVX,BVXX
13     COMMON/PARM0/AP,PMI,J,PMAX,WDOT,III,IJJ,WDOTD,NSLOT,NTABE,NTIME,
1          TAJT0,TOFLAS,NINCPL,BRNOUT,IIS,IS1,IS2,NI,SCUR(18,2)
14     COMMON/PARMC/DELL3,DELL7,371,B91
15     COMMON/PARME/RCG,DELLI,XBARIN,HCR,KWITI,KWIT2,LSWITI,ALSX,
1          AJPN,AJPH
16     COMMON/PARMO/ALP,KRAS88,<XRS88,KGAM
17     RI=RF-TAUW-ALS1
18     AV1=A(5)
19     AV2=A(4)
20     AV3=A(4)
21     BV1M=B91M
22     BV2M=B92M
23     THV=TH3
24     TV2=T12M
25     TV4=T10M
26     TV5=T10M
27     TV6=T10M
28     TV7=T9M
29     ALVA=ALE
30     ALV3=ALD
31     ALVC=0.
32     RV1=R9
33     RV2=R8
34     RV3=R7
35     RV4=0.
36     RV5=R6
37     RV7=R09
38     XV7=X09

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55520
55790
55810
55820
55830
55840
55860
55880
55890
55900
55910
55920
55930
55940
55950
55960
55970
55980
55990
56000
56010
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56040
56050
56060
56070

```

39		AFS=0.0	56110
40		AFP=0.	56120
41		ASLVR=0.0	56130
42		RSLVRV=0.0	56140
43		TAUTOV=0.0	56150
44		DO 10 I=1,13	56160
45	10	AL(I)=0.0	56170
46		IF((R6+R7+R8+ALD+ALE).LT.1.0E-06)GO TO 20	56180
47		CALL AFPSUB	56190
48	20	CONTINUE	56200
49		AL(13)=AL(1)	56210
50		AL(12)=AL(2)	56220
51		AL(11)=AL(3)	56230
52		AL(10)=AL(4)	56240
53		AL(9)=AL(7)	56250
54		AFS=AFP	56260
55		DEL7=DELL3	56270
56		B91=BV1	56280
57		AV1=A(1)	56290
58		AV2=A(2)	56300
59		AV3=A(3)	56310
60		HV1M=B71M	56320
61		BV2M=B/2M	56330
62		THV=TH2	56340
63		TV2=T2M	56350
64		TV4=T4M	56360
65		TV5=T5M	56370
66		TV6=T6M	56380
67		TV7=T7M	56390
68		ALVA=ALA	56400
69		ALVB=ALB	56410
70		ALVC=ALC	56420
71		RV1=R1	56430
72		RV2=R2	56440
73		RV3=R3	56450
74		RV4=R4	56460
75		RV5=R5	56470
76		RV7=R07	
77		XV7=X07	
78		RSLVRV=HSLVR	56500
79		THSLVV=0.0	
80		AL7=0.0	56520
81		AL8=0.0	56530
82		TAUTOV=TAUTO	56540
83		CALL AFPSUB	56550
84		DEL3=DELL3	56560
85		B71=BV1	56570
86		IF(TAUW-TAUTO-TAU)40,30,30	56580
87	30	TEM1=RF-TAUW+TAU	56590
88		AL(8)=TEM1*TH4	56600
89		AFP=AFP+(RF**2-TEM1**2)*TH4+AFS	56610
90		GO TO 80	56620
91	40	IF(TAUTO)70,70,50	56630
92	50	IF(TAUW-TAUZTO(III))70,70,60	56640
93	60	TEMP=RF-TAUW+TAUZTO(III)	56650

94		AFP=AFP*(RF**2,-TEMP**2.)*TH4+AFS	56660
95		ALB=TEMP*TH4	56670
96		AL(8)=0.0	56680
97		GO TO 80	56690
98	70	AL(8)=0.0	56700
99		ALB=0.0	56710
100		DEL3=DELL3	56720
101		B71=HV1	56730
102	80	TEM1=0.0	56740
103		DO 90 I=1,13	56750
104	90	TEM1=TEM1+AL(I)	56760
105		ALP=(TEM1+ALP)*2.*ANO	56770
106		IF(ALP)100,100,110	56780
107	100	ALP=0.	56790
108	110	AP=RF**2*PI-AFP*ANO	56800
109		IF(TAU.LT.1.0E-06)AFF=AFP*ANO	56810
110		IF(KMOICG)130,120,130	
111	120	KWIT1=1	56830
112		KWIT2=1	56840
113		TAUA0=TAU	56850
114		K=0	56860
115		CALL PT1AA(K)	56870
116	130	RETURN	56880
117		END	

SYMBOL	-----	REFERENCES	-----
10	- 4400	45*	
20	- 46	48*	
30	- 86	87*	
40	- 86	91*	
50	- 91	92*	
60	- 92	93*	
70	- 91	92	98*
80	- 90	97	102*
90	- 10300	104*	
100	- 106	107*	
110	- 106	108*	
120	- 110	111*	
130	- 110	116*	
A	- 4C0	18	19 20 27 58 59
AFF	- 9C0	109*	
AFP	- 12C0	40*	54 89= 94= 108 109
AFPSUB	- 47*	83*	
AFS	- 39*	54=	89 94
AHH	- 6C0		
AHO	- 8C0		
AINC	- 5C0		
AJBHED	- 6C0		
AJBHN	- 6C0		
AJBNOZ	- 6C0		
AJPH	- 15C0		
AJPHED	- 6C0		
AJPHN	- 6C0		
AJPN	- 15C0		
AJPN0Z	- 6C0		
AJPP	- 9C0		
AL	- 9C0	45=	49= 50= 51= 52= 53= 88= 96= 98= 104
ALA	- 5C0	68	
ALB	- 5C0	69	
ALC	- 4C0	70	
ALD	- 4C0	30	46
ALE	- 5C0	29	46
ALL	- 9C0		
ALP	- 16C0	105=	106 107=
ALPX	- 8C0		
ALPY	- 8C0		
ALSX	- 15C0		
ALS1	- 5C0	17	
ALS2	- 5C0		
ALVA	- 10C0	29=	68=
ALVB	- 10C0	30=	69=
ALVC	- 10C0	31=	70=
AL7	- 12C0	80=	
AL8	- 12C0	81=	95= 99=
ANO	- 5C0	105	108 109
AP	- 13C0	108=	
APX	- 8C0		
APY	- 8C0		
ASE	- 9C0		

I N D E X

SUBROUTINE LPDAPS

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ASI	-	9C0			
ASLVR	-	8C0	41=		
AV1	-	10C0	18=	57=	
AV2	-	10C0	19=	58=	
AV3	-	11C0	20=	59=	
AW	-	5C0			
URNOUT	-	13C0			
BVX	-	12C0			
BVXX	-	12C0			
BV1	-	11C0	56	85	101
BV1M	-	11C0	21=	60=	
BV2	-	11C0			
BV2M	-	11C0	22=	61=	
B71	-	14C0	85=	101=	
B71M	-	4C0	60		
B72M	-	4C0	61		
B91	-	14C0	56=		
B91M	-	4C0	21		
B92M	-	4C0	22		
* COMB	-	6*			
* COMB	-	7*			
* COM0	-	8*			
* COM1	-	9*			
* COMY	-	10*			
* COMZ	-	11*			
* CONSTS	-	2*			
DELL1	-	15C0			
DELL3	-	10C0	55	84	100
DEL3	-	14C0	84=	100=	
DEL7	-	14C0	55=		
DTINT	-	6C0			
DWDOT	-	7C0			
GN01	-	2C0			
HCR	-	15C0			
HE	-	9C0			
I	-	4400	45	10300	104
III	-	13C0	92	93	
I1J	-	13C0			
IIS	-	13C0			
* INPUT0	-	3*			
IS1	-	13C0			
IS2	-	13C0			
K	-	114=	115AG		
KGAM	-	16C0			
KMOICG	-	3C0	110		
KPLANE	-	3C0			
KRASBB	-	16C0			
KWIT1	-	15C0	111=		
KWIT2	-	15C0	112=		
KXRSBB	-	16C0			
* LPDAPS	-	1*			
LSWITI	-	15C0			
NI	-	13C0			
NINCPL	-	13C0			
NSLOT	-	13C0			

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SUBROUTINE LPDAPS

PAGE 140

TAUWDP	-	7C0					
TAUZ	-	7C0					
TAUZTO	-	7C0	92	93			
TEMP	-	93=	94	95			
TEM1	-	87=	88	89	102=	104=	105
THSLV	-	8C0					
THSLVV	-	8C0	79=				
THV	-	11C0	23=	62=			
TH1	-	4C0					
TH2	-	4C0	62				
TH3	-	4C0	23				
TH4	-	4C0	88	89	94	95	
TOFLAG	-	13C0					
TV2	-	10C0	24=	63=			
TV4	-	10C0	25=	64=			
TV5	-	10C0	26=	65=			
TV6	-	10C0	27=	66=			
TV7	-	10C0	28=	67=			
T10M	-	4C0	25	26	27		
T12M	-	4C0	24				
T2M	-	4C0	63				
T4M	-	4C0	64				
T5M	-	4C0	65				
T6M	-	4C0	66				
T7M	-	4C0	67				
T9M	-	4C0	28				
VF	-	7C0					
VP	-	7C0					
VGLVR	-	8C0					
WDOT	-	13C0					
WDOTD	-	13C0					
WI	-	9C0					
WORKA	-	5*					
WORK45	-	4*					
WT	-	9C0					
XBARIH	-	9C0					
XBARIN	-	15C0					
XBM	-	6C0					
XBN	-	6C0					
XR	-	9C0					
XV7	-	10C0	38=	77=			
X011	-	4C0					
X03	-	4C0					
X05	-	4C0					
X07	-	4C0	77				
X09	-	4C0	38				
X45	-	4C0					
X76	-	4C0					
Y011	-	4C0					
Y03	-	4C0					
Y05	-	4C0					
Y07	-	4C0					
Y09	-	4C0					
Y45	-	4C0					
Y76	-	4C0					

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1      SUBROUTINE LPTO
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      SUBROUTINE LPTO DETERMINES THE PERIMETER LENGTH AL7 AND AL8 OF THE
C      ANISOTROPIC PROPELLANT IN SECTORS 7 AND 8 DURING THE MOTOR TAIL-
C      OFF INTERVAL (SECTION 4.3.3).
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
2      COMMON/CONSTS/GVOT,PI,PI02,RADIAN
3      COMMON/INPUTU/DELTA,PA,PHI,HCO,DELTA,KDUMP(72)
4      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3          TH3,TH4,B71M,B72M,B91M,B92M
5      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALB,ALE,AW(5)
6      COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RBZTO(101),PU(101),
1          TAUWDP(101),RB,VF,DWDOT,VP
7      COMMON/COMH/TAUTOZ,RSLVRN,AX(45),AY(45),AINCX,ANOX,RFX,TAUWX,
1          DUMX(17),A INCY,ANQY,RFY,TAUWY,DUMY(17),VFPP
8      COMMON/COMD/THSLV,RSLVR,THSLVY,ASLVR,AHO,RFH,ALPX,APX,
1          RBHI,ALPY,APY,VSLVR
9      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASF,AF,FI,WT,RA,
1          RAO,ALL,AJPP,ASI
10     COMMON/COMZ/AV3,BV1M,BV2M,THV,RV5,HV7,BV1,BV2,RSLVRV
11     COMMON/PARMA/AF,AL7,ALB,TAUTOV,BVX,BVXX
12     COMMON/PARM3/AF,PMIN,PMAX,WDOT,III,IIJ,WDOTD,NSLOT,NTABE,NIME,
1          TAUTO,TOFLAG,NINCPL,BRNOUT,IIS,IS1,IS2,NI,SCUR(18,2)
13     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
1          ANW,AKRSI
14     TAUTOV=TAUTO
15     RSLVRV=RSLVR
16     IF(TAU,LT,RSLVRV)GO TO 10
17     AL(7)=0.0
18     AL(8)=0.0
19     AL7=0.0
20     AL8=0.0
21     AFP=PI*RF**2.-AP
22     GO TO 160
23     10 CONTINUE
24     CALL TRAN(AINCX,AINC,21)
25     CALL TRAN(AX,A,45)
26     BV2MX=B72M
27     BV1MX=B71M
28     THVX=TH2
29     RV7X=R07
30     RV5X=R5
31     AV3X=A(3)
32     THV4X=TH4
33     CALL TRAN(AINCY,AINC,21)
34     CALL TRAN(AY,A,45)
35     BV2MY=B72M
36     BV1MY=B71M
37     THVY=TH2
38     RV7Y=R07
39     RV5Y=R5
40     AV3Y=A(3)

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91670
91690
91700
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41      THV4Y=TH4                      92030
42      TEMP=(AINCW-AINCX)/(AENCY-AINCX) 92040
43      BV2M=BV2MX+TEMP*(BV2MY-BV2MX)    92050
44      BV1M=BV1MX+TEMP*(BV1MY-BV1MX)    92060
45      THV=THVX+TEMP*(THVY-THVX)        92070
46      RV7=RV7X+TEMP*(RV7Y-RV7X)        92080
47      RV5=RV5X+TEMP*(RV5Y-RV5X)        92090
48      AV3=AV3X+TEMP*(AV3Y-AV3X)        92100
49      THV4=THV4X+TEMP*(THV4Y-THV4X)    92110
50      RF=RFX+TEMP*(RFY-RFX)            92120
51      AFP=PI*RF**2.-AP                 92130
52      AL8=0.0                          92140
53      20 IF (TAUW-TAUTOV-TAU) 50,30,30 92150
54      30 CONTINUE                      92160
55      40 BV2=BV2M                       92170
56      BV2P=BV2M                        92180
57      50 TEMPD=AMIN1((RSLVRV-TAU),TAUTOV) 92190
58      TEMPD=AMAX1(0.0,TEMPD)           92200
59      LTA22=ACOS(((RF-TEMPD)**2+RV7**2-(RV5+TAU)**2)/(2.*(RF-TEMPD)*RV7
X)) 92210
60      BV2P=ACOS(((TAU+RV5)**2+(RF-TAUW-RV5)**2-(RF-TEMPD)**2)/(
X2.*(TAU+RV5)*(RF-TAUW-RV5)))-BV1M-AV3-PI02+THV 92220
61      BV2P=AMAX1(BV2P,BVX)             92250
62      ETA2=BV2M-BV2P                   92260
63      IF (TAUW-TAU) 70,60,60            92270
64      60 CONTINUE                       92280
65      BV2=BV2M                          92290
66      AFP=AFP+ANO*((TAU+RV5)**2.*ETA2-(TAU+RV5)*(TAUTOZ+RV5)*SIN(ETA2)
X+THV4*(RF-TAUW+TAU)**2.-THV4*(RF-TAUW+TAUTOZ)**2.) 92300
67      AFP=AMAX1(AFP,0.0)                92310
68      AL7=SQRT((RV5+TAU)**2+(RV5+TAUTOZ)**2-2.*COS(ETA2)*(RV5+TAU)*
X(RV5+TAUTOZ)) 92320
69      AL(8)=2.*ANO*(RF-TAUW+TAU)*THV4 92330
70      AL8=(RF-TAUW+TAUTOZ*(II)))*THV4 92340
71      GO TO 100                          92350
72      70 ANGLE=ACOS((RF**2+RV7**2-(RV5+TAU)**2)/(2.*RF*RV7)) 92360
73      HV2=ACOS(((TAU+RV5)**2+(RF-TAUW-RV5)**2-(RF**2+RV7**2)/(
X2.*(TAU+RV5)*(RF-TAUW-RV5)))-BV1M-AV3-PI02+THV 92370
74      BV2=AMAX1(BV2,BVX)                 92380
75      IF (TAUW-TAUTOZ) 90,80,80          92390
76      80 CONTINUE                       92400
77      AFP=AFP+ANO*(ETA22*RF**2-(RF-TAUTOV)*(RF-TAUW+TAUTOZ)*SIN(ETA22)
X-RF**2.*(ETA22-ANGLE)-RF*RV7*SIN(ANGLE)+(RV5+TAU)**2.*(BV2-
XBV2P)+(RF-TAUTOV)*RV7*SIN(ETA22)) 92410
78      AFP=AMAX1(AFP,0.0)                 92420
79      AL7=SQRT((RV5+TAU)**2+(RV5+TAUTOZ)**2-2.*COS(ETA2)*(RV5+TAU)*
X(RV5+TAUTOZ)) 92430
80      AL8=(RF-TAUW+TAUTOZ*(III))*THV4 92440
81      AL(8)=0.0                          92450
82      GO TO 100                          92460
83      90 ETA11=ACOS((RF**2+RV7**2-(RV5+TAUTOZ)**2)/(2.*RF*RV7)) 92470
84      ETA1=ETA11+ACOS((RF**2+(RV5+TAUTOZ)**2-RV7**2)/(2.*RF*
X(RV5+TAUTOZ))) 92480
85      AFP=AFP+ANO*(RF**2.*(ETA22-ETA11)-(RF-TAUTOV)*RF*SIN(ETA22-ETA11)
X-RF**2.*(ETA22-ANGLE)-RF*RV7*SIN(ANGLE)+(RF-TAUTOV)*RV7*SIN(ETA22)) 92490

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SYMBOL	-----	REFERENCES	-----
10	-	16	23*
20	-	53*	
30	-	53	54*
40	-	55*	
50	-	53	57*
60	-	63	64*
70	-	63	72*
80	-	75	76*
90	-	75	83*
100	-	71	82
130	-	93	94*
140	-	95	96*
150	-	97WR	98*
160	-	22	93
A	-	4CO	25AG
	-	THE VARIABLE~	ACOS
ACOS	-	59	72
AFF	-	9CO	92=
AFP	-	11CO	21=
AHO	-	8CO	51=
AINC	-	5CO	24AG
AINCW	-	13CO	42
AINCX	-	7CO	24AG
AINCY	-	7CO	33AG
AJPP	-	9CO	42
AKGY	-	13CO	
AKRST	-	13CO	
AL	-	9CO	17=
ALA	-	5CO	18=
ALB	-	5CO	69=
ALC	-	4CO	81=
ALD	-	6CO	89=
ALE	-	5CO	90=
ALL	-	9CO	
ALPX	-	8CO	
ALPY	-	8CO	
ALS1	-	5CO	
ALS2	-	5CO	
AL7	-	11CO	19=
AL8	-	11CO	20=
AMAX1	-	58	61
AMIN1	-	57	67
AMPN	-	13CO	
ANW	-	13CO	
ANGLE	-	72=	77
ANO	-	5CO	66
ANOX	-	7CO	
ANOY	-	7CO	
AP	-	12CO	21
APX	-	8CO	
APY	-	8CO	
ASE	-	9CO	
ASI	-	9CO	

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I N D E X

SUBROUTINE LPTD

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NSLOT	-	12C0												
NTABE	-	12C0												
NTME	-	12C0												
P	-	13C0												
PA	-	3C0												
* PARMA	-	11*												
* PARMB	-	12*												
* PARMF	-	13*												
PD	-	6C0												
PH	-	13C0												
PHI	-	3C0												
PI	-	2C0	21	51	91									
PI02	-	2C0	60	73										
PMAx	-	12C0												
PMIN	-	12C0												
PON	-	13C0												
RA	-	9C0												
RADIAN	-	2C0												
RAO	-	9C0												
RB	-	6C0												
RBHI	-	8C0												
RBZ	-	6C0												
RBZTD	-	6C0												
RC	-	9C0												
* RETURN	-	99*												
RF	-	5C0	21	50=	51	59	60	65	69	70	72	73	77	80
	-	83	84	85	91	97WR								
RFHI	-	8C0												
RFX	-	7C0	50											
RFY	-	7C0	50											
RSLVR	-	8C0	15											
RSLVRN	-	7C0												
RSLVRV	-	10C0	15=	16	57	97WR								
RV5	-	10C0	47=	59	60	66	72	73	77	79	83	84	85	
	-	87	90											
RV5X	-	30=	47											
RV5Y	-	39=	47											
RV7	-	10C0	46=	59	72	77	83	84	85					
RV7X	-	29=	46											
RV7Y	-	38=	46											
R011	-	4C0												
R03	-	4C0												
R05	-	4C0												
R07	-	4C0	29	38										
R09	-	4C0												
R1	-	4C0												
R2	-	5C0												
R3	-	5C0												
R4	-	5C0												
R5	-	5C0	30	39										
R6	-	5C0												
R7	-	5C0												
R8	-	5C0												
R9	-	4C0												
SCUR	-	12C0												

I N D E X

SUBROUTINE LPT0

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* SIN	-	66	77	85										
* SQRT	-	68	79	87										
SUMDV	-	9C0												
T	-	13C0												
TAU	-	9C0	16	53	57	59	60	63	66	68	69	72	73	77
	-	79	85	87	90	97WR								
TAUM	-	4C0												
TAUTO	-	12C0	14											
TAUTOV	-	11C0	14=	53	57	77	85							
TAUTOZ	-	7C0	66	68	75	77	79	83	84	87				
TAUW	-	5C0	53	60	63	66	69	70	73	75	77	80		
TAUWDP	-	6C0												
TAUWX	-	7C0												
TAUWY	-	7C0												
TAUZ	-	6C0												
TAUZTO	-	6C0	70	80										
TEMP	-	42=	43	44	45	46	47	48	49	50				
TEMPD	-	57=	53=	59	60									
THSLV	-	8C0												
THSLVV	-	8C0	97WR											
THV	-	10C0	45=	60	73	97WR								
THVX	-	28=	45											
THVY	-	37=	45											
THV4	-	49=	66	69	70	80								
THV4X	-	32=	49											
THV4Y	-	41=	49											
TH1	-	4C0												
TH2	-	4C0	28	37										
TH3	-	4C0												
TH4	-	4C0	32	41										
TIME	-	13C0												
TOFLAG	-	12C0												
* TRAN	-	24*	25*	33*	34*									
T10M	-	4C0												
T12M	-	4C0												
T2M	-	4C0												
T4M	-	4C0												
T5M	-	4C0												
T6M	-	4C0												
T7M	-	4C0												
T9M	-	4C0												
U	-	13C0												
VF	-	6C0												
VFPP	-	7C0												
VP	-	6C0												
VSLVR	-	8C0												
WDOT	-	12C0												
WDOTD	-	12C0												
WI	-	9C0												
* WORKA	-	5*												
* WORK45	-	4*												
WT	-	9C0												
XBARIH	-	9C0												
XR	-	9C0												
X011	-	4C0												

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SUBROUTINE LPT0

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X03	-	4C0
X05	-	4C0
X07	-	4C0
X09	-	4C0
X45	-	4C0
X76	-	4C0
Y011	-	4C0
Y03	-	4C0
Y05	-	4C0
Y07	-	4C0
Y09	-	4C0
Y45	-	4C0
Y76	-	4C0

```

1      SUBROUTINE MACH(ARINPT,GAMA,M)
2      IMPLICIT REAL (A-H,O-Z,M)
      C*** ITERATION ROUTINE FOR SUBSONIC (M,LE.1.0) NOZZLE SECTION.
      C*** INPUTS: ARINPT= AREA RATIO
      C***          GAMA = SPECIFIC HEAT RATIO
      C*** OUTPUT: M= MACH NUMBER
3      AR(AG1)=(1./AG1)*(((2./(GAMA+1.))*(1.+((GAMA-1.)/2.)*(AG1**2))))**
      $ ((GAMA+1.)/(2.*(GAMA-1.))))
4      IF(ARINPT.GE.2.4) GO TO 10
5      IF(ARINPT.GE.1.1) GO TO 30
6      IF(ARINPT.GE.1.0) GO TO 40
7      WRITE(6,1) ARINPT
8      1 FORMAT('ERROR IN SUBROUTINE MACH, ARINPT LESS THAN ONE/' ARINPT=
      $',E15.8)
9      STOP
10     ITER=0
11     M1=0.1
12     AR1=AR(M1)
13     M2=0.25
14     20 AR2=AR(M2)
15     23 IF(AR2.GE.(ARINPT-.0001) .AND. AR2.LE.(ARINPT+.0001)) GO TO 50
16     SLOPE=(M1-M2)/(AR1-AR2)
17     BINT = M1 - SLOPE*AR1
18     M1=M2
19     AR1=AR2
20     M2=SLOPE*ARINPT+BINT
21     IF(M2.GT.1.0) M2=1.0
22     ITER = ITER + 1
23     IF(ITER.LT.15) GO TO 20
24     WRITE(6,25) M1,M2,AR1,AR2,ARINPT,GAMA
25     25 FORMAT('NO CONVERGENCE IN SUBROUTINE MACH/' M1='E15.8/' M2='E1
      $5.8/' AR1='E15.8/' AR2='E15.8/' ARINPT='E15.8/' GAMA='E15.8)
26     STOP
27     30 M1=0.25
28     AR1=AR(M1)
29     M2=0.70
30     AR2=AR(M2)
31     ITER=0
32     GO TO 23
33     40 M1=0.70
34     AR1=AR(M1)
35     M2=1.00
36     AR2=1.0
37     ITER=0
38     GO TO 23
39     50 M=M2
40     RETURN
41     END

```

SYMBOL	REFERENCES									
1	-	7WR	8*							
10	-	4	10*							
20	-	14*	23							
23	-	15*	32	38						
25	-	24WR	25*							
30	-	5	27*							
40	-	6	33*							
50	-	15	39*							
AG1	-	THE VARIABLE- AG1 -IS USED BEFORE IT IS DEFINED								
AR	-	3=	12	14	28	30	34			
ARINPT	-	1AG	4	5	6	7WR	15	20	24WR	
AR1	-	12=	16	17	19=	24WR	28=	34=		
AR2	-	14=	15	16	19	24WR	30=	36=		
BINT	-	17=	20							
GAMA	-	1AG	3	24WR						
ITER	-	10=	22=	23	31=	37=				
M	-	1AG	39=							
* MACH	-	1*								
M1	-	11=	12	16	17	18=	24WR	27=	28	33=
M2	-	13=	14	16	18	20=	21	24WR	29=	30
* RETURN	-	40*								39
SLOPE	-	16=	17	20						
* STOP	-	9*	26*							

```

1  SUBROUTINE MNCHN1
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 14710
C  SUBROUTINE MNCHN1 IS THE CONTROL ROUTINE WHICH COMPUTES THE 15160
C  CONSTANTS THAT DEFINE THE GEOMETRY OF THE GRAIN CROSS-SECTION
C  LONGITUDINAL CONFIGURATION, CHECKS FOR DATA ERRORS, AND PRINTS
C  CONSTANTS
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 15250
2  DIMENSION AN(45),AINC(21)
3  COMMON/BLK005/ NLEWIS,VSI,NF,NRECON,NCASES,NDISP,NCASE
4  COMMON/CUNTS/GNOT,PI,PI02,RADIAN
5  COMMON/INPUT1/AINCIN(18),ANO(18),RF(18),TAUW(18),R2(18),
1  R3(18),R4(18),R5(18),R6(18),R7(18),R8(18),
2  ALS1(18),ALS2(18),ALA(18),ALB(18),ALE(18),A01(18),
3  A02(18),A03(18),A04(18),A05(18)
6  COMMON/INPUT2/TH0(18),ISLVR(18)
7  COMMON/INPUT3/GEDCON(45,18)
8  COMMON/INPUT4/NCEO(18),APORT(18),TAUPL(50,18),ALPPL(50,18),
1  AKGYP(50,18),TAUHD(50),ABHD(50),PMOHD(50),
2  RMOHD(50),XCGHD(50),TAUN(50),ABN(50),PMOIN(50),
3  RMOIN(50),XCGN(50),NGEHD,NGEUMN
9  COMMON/INPUTA/BTAOE,DH1,BH,AOHM,RIG,MHR
10 COMMON/INPUTB/AONM,BN,DNI
11 COMMON/INPUTH/AINCPL,VCHINP,VCNINP
12 COMMON/INPUTM/STFLAG,STDYST,DELTST,DELTSS,DELTTO
13 COMMON/INPUTO/KPLANE,KMOICG
14 COMMON/INPUTQ/CRP,CRT,CRW
15 COMMON/INPUTT/SB(18),SLTBRN(18),SA(18)
16 COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KDUMP(72)
17 COMMON/INPUTV/ VFNOA,VFN0B,VCNINA,VCNINB
18 COMMON/DUNYC/NTEST,TIMECK
19 COMMON/DUNYM/CKTIME,NTEST4
20 COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1  R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2  ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3  TH3,TH4,B71M,B72M,B91M,B92M
21 COMMON/WORKA/AINC(1),ANODM,RFDM,TAUWDM,R2DM,R3DM,R4DM,R5DM,R6DM,
1  R7DM,R8DM,ALS1DM,ALS2DM,ALA0M,ALB0M,ALEDM,AW(5)
22 COMMON/WORKDE/DE1,BE,ADEM
23 COMMON/WORKRE/RE1(1),ALFEM,ALFE,RE2,HE1,HE2,HED,HER,VFEO,VCE,
1  TAU0,TAUE1,CAE,CBE,CCCE,CCVE,CDCE,CDVE,CECE,CEVE
24 COMMON/WORKRH/RH1(5),HH2,ACG,HHW,VFHO,VCH,ANK(10)
25 COMMON/WORKRN/RN1(8),VFNO,VCN,ACK(10)
26 COMMON/XOAPW/RAAP,XRATAP,THRBP,GAM1AP,GAM2AP,XOAP,YOAP,ZOAP,
1  X2AP,Y2AP,Z2AP,X1AP,Y1AP,Z1AP,OAP(3),T62AP,STRAP,
2  CTRAP,AAP,BAP,CAP,DAP,BTA0AP,SOAP(4),ALTAP
27 COMMON/XOBPW/RABP,XRATBP,THRBP,GAM1BP,GAM2BP,XOBP,YOBP,ZOBP,
1  X2BP,Y2BP,Z2BP,X1BP,Y1BP,Z1BP,OBP(3),T62BP,STRBP,
2  CTRBP,TP1BP,ABP,BBP,CBP,DBP,BTA0BP,SOBP(4),ALTBP
28 COMMON/XOAWUR/RAA,XRAT1,THRA,GAMA1A,GAMA2A,XOA,YOA,ZOA,X2A,Y2A,
1  Z2A,X1A,Y1A,Z1A,X3A,Y3A,Z3A,TANG2A,SINTRA,COSTRA,
2  TANP1A,AAAA,RA,CA,DA,BTA0A,SINGA2,COSGA2,SINGA1,
3  COSGA1,ALTA
29 COMMON/XOBWOR/RAB,XRATB,THRB,GAMA1B,GAMA2B,XOB,YOB,ZOB,X2B,Y2B,
1  Z2B,X1B,Y1B,Z1B,X3B,Y3B,Z3B,TANG2B,SINTRB,COSTRB,
2  TANP1B,ABB,BB,CB,DB,BTA0B,SINGB2,COSGB2,SINGB1

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ORIGINAL PAGE IS
OF POOR QUALITY

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3      COSGB1,ALT3
30     COMMON/XOWORK/X0,Y0,Z0,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTHR,
1      COSTHR,TANPH1,A0,H0,C0,D0,BTA0,SINGM2,COSGM2,
2      SINGM1,COSGM1,ALTO
31     COMMON/COMA/DELT,APHI,WOOTI,ANIB0,TIMEW,UT,ANLOPS,ACCEL,
1      ABCYL,PRNT(101,15),AINCHI,AMACH,ZCALC(101)
32     COMMON/COMB/AHH,AJPHN,AJBHN,TAUA0,AJPHE),AJBHE0,AJPN0Z,AJBNOZ,
1      XBH,XBN,DTINT
33     COMMON/COMC/AMTJ,AMTI,AJPH0,AJBH0,XBIH,ALU
34     COMMON/COME/TAUWEI,ACGA,XCGB,ZRO,ACGA,ACGB,RCGO,ZCG,YCG,YRO,YI
35     COMMON/COMG/TAUZ(101),RBZ(101),TAUZT0(101),RBZT0(101),PD(101),
1      TAUWDP(101),RB,VF,DWDOT,VP
36     COMMON/COMH/POPR(101),V(101),VPR(101)
37     COMMON/COMJ/ABSLTA(18),ABSLTF(18),APA(18),APF(18),PSA(18),
1      PSF(18),POA(18),POF(18),TSA(18),TSF(18),UA(18),
2      UF(18),WSLOT(18),WSLOTI(18)
38     COMMON/COML/THO
39     COMMON/COMM/TAUTOZ,MSLVN,AX(45),AY(45),AINCX,ANDX,HFX,TAUWX,
1      DUMX(17),AINCY,ANDY,RFY,TAUWY,DUMY(17),VFPP
40     COMMON/COMN/TSLVX,TSLVY
41     COMMON/COMO/THSLV,TSLVJH,THSLV,ASLVR,AHO,RPHI,ALPX,APX,
1      RPHI,ALPY,APY,VSLVR
42     COMMON/COMP/DELL,RT,ALAMIN,AWE,AMIN,ALX,ALAMDA
43     COMMON/COMQ/DELL0,DELLOI
44     COMMON/COMR/DELLR,RPZ,XPZ,AZ
45     COMMON/COMT/TAURC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,
1      RAD,ALL,AJPP,ASI
46     COMMON/COMU/VXX,ALITQ,COUNT,VFHEWI,VEX,VR,ASTO,ARIGH
47     COMMON/COMV/VSTR,VSTO,TOMAX,DOLA,DOIB,XMAX,ZMAX,YMAX,ALHO,
1      ROPE1,ROPE2,ROPE3,ALDP
48     COMMON/COMW/DV,AEE,PEPOI
49     COMMON/COMX/COSA(5),S1VA(5),DTAUX,DTAUWX
50     COMMON/COMY/AV1,AV2,TV2,TV4,TV5,TV6,TV7,ALVA,ALVd,ALVC,RV2,RV3,
1      RV4,XV7,DELL3,RV1
51     COMMON/COMZ/AV3,BV1M,BV2M,THV,RV5,RV7,BV1,BV2,RSLVV
52     COMMON/PARMA/AFB,AL7,AL8,TAUTOV,BVX,BVXX
53     COMMON/PARMH/AP,PMIN,PMAX,WOOT,III,IIJ,WOOTO,NSLOT,NTAUE,NTMF,
1      TAUTO,TOFLAG,NINCPL,BRNOUT,IIS,ISI,IS2,NI,SCUR(18,2)
54     COMMON/PARMC/DEL3,DEL7,B71,B91
55     COMMON/PARMD/KRASUB,KXRSUB,AJBB,HEI,AJBN,AJBH,XHARI
56     COMMON/PARME/RCG,DELLI,XBARIN,HCR,KWIT1,KWIT2,LSWIT1,ALSX,
1      AJPN,AJPH
57     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
1      AMW,AKRST
58     COMMON/PARG/VFH,AAN,VFN,VIS,AIT,SPHDT,SPONDT,VFINT,VEH,ABTOT
59     COMMON/PARMH/B1E,BOE,AANV,BX,RXX,AS11,DELLRI,ROPE4,AIE,YPI,ZP1,
1      ARCO,ARC1,ROE1,ALITTL,ZI,AIG,THRI,THRO,AOE
60     COMMON/PARMI/ADM CYL,AIBCYL,AIPCYL,AKGYX,AKGY,VPH,VPN
61     COMMON/PARMJ/NTH
62     COMMON/PARMK/F,EPI,PEPO,CFOL,VFWEB,WU,DEED,CLOPS,CFO,WTOT,
1      SWDOTN
63     COMMON/PARML/HOLDR,AL3A,BRAK,AL11A,AS,RPX,ZPO,YPO,DS,KBRAK,KVSTR
64     COMMON/PARMH/RAT,XRAT,THR,GAMA1,GAMA2,Z1AT
65     COMMON/PARMN/DPRA,DPSA
66     COMMON/PARMO/ALP,KRASB,KXRSB,KGAM

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67      COMMON/PARMP/THRZ,RP1,RP2,RP3,RP4,RP5,RP6,RP10,RP11,RP12,RP13,XP1,
        1      XP3,XP5,XP11,XP13
68      COMMON/PARMQ/RGYP(18),AFRPL(18),ALPRP(18)
69      COMMON/PARMS/ICHN
70      COMMON/PARMU/ANI
71      COMMON/PARMV/WF
72      COMMON/PARMAB/ HSUBMG,NSUBMG,NEND,ASEA,ASEB,SUMDVA,SUMDVB
73      COMMON/PARMAD/ PMOINA(50),PMOINB(50),RMOINA(50),RMOINB(50),
        $      XCGNA(50),XCGNB(50),ABNA(50),ABNB(50)
74      COMMON/PARMAG/ TXSUB(20),TRSUB(20),NPSUB
75      COMMON/PARMAH/ VNOZSB,THETEX,SIRATC,NCONT
76      COMMON/PARMAI/ VFNA,VFNB,VCNA,VCNB
        CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 15360
        C IF THIS IS FIRST CASE, INITIALIZE DATA CELLS
        CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 15400
77      IF(NSUBMG,LE,0) GO TO 20
78      NPSBM1=NPSUB-1
79      DO 10 I=1,NPSBM1
80      VNOZSB = VNOZSB + (PI/3.)*(TRSUB(I)**2 + TRSUB(I+1)**2 + TRSUB(I)*
        $ TRSUB(I+1))*(TXSUB(I+1)-TXSUB(I))
81      10 CONTINUE
82      20 IF(NCASE.GT.0) GO TO 30
83      PEP01=0.05 15450
84      BYEBYE = 0.0 15270
85      30 CONTINUE
86      50 IF(DELZ)60,60,80 15510
87      60 WRITE(6,70) 15520
88      70 FORMAT(13H0INVALID DELZ/34H0(DELZ LESS THAN OR EQUAL TO ZERO)/44H0 15530
        XABOVE ERROR OCCURRED AT STATEMENT NUMBER 76) 15540
89      GO TO 970 15550
90      80 CONTINUE
91      IF(NCASE.EQ.0) GO TO 290
92      IF(NGEU(1).GT.0) GO TO 140
93      110 DO 115 I=1,45
94      A(I)=0.0
95      DO 115 J=1,18
96      115 GEOCON(I,J)=0.0
97      DE1=0.0
98      BE =0.0
99      AOEM=0.0
100     DO 11 I=1,18
101     11 NGE0(I)=0
102     IF(NGEOHD.GT.0) GO TO 1010
103     DO 1001 I=1,50
104     TAUHD(I)=0.0
105     ABHD(I)=0.0
106     PMOIH(I)=0.0
107     RMOIH(I)=0.0
108     1001 XCGHD(I)=0.0
109     1010 IF(NGEOMN.GT.0) GO TO 1020
110     DO 1016 I=1,50
111     TAUN(I)=0.0
112     ABN(I)=0.0
113     PMOIN(I)=0.0
114     RMOIN(I)=0.0

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115      XCGN(I)=0.0
116      IF(NSUBMG.EQ.0) GO TO 1016
117      ABNA(I)=0.0
118      ABNB(I)=0.0
119      PMOINA(I)=0.0
120      PMOINB(I)=0.0
121      RMOINA(I)=0.0
122      RMOINB(I)=0.0
123      XCGNA(I)=0.0
124      XCGNB(I)=0.0
125      1016 CONTINUE
126      1020 DO 1050 I=1,18
127          IF(NGEO(I).GT.0) GO TO 1050
128          DO 1040 J=1,50
129              TAUP(L(J,I))=0.0
130              ALPPL(J,I)=0.0
131          1040 AKGYP(J,I)=0.0
132      1050 CONTINUE
133      140 DO 150 I=1,101
134          TAUZ(I)=0.0
135          RBZ(I)=0.0
136          TAUZTO(I)=0.0
137          RBZTO(I)=0.0
138          TAUWDP(I)=0.0
139          PD(I)=0.0
140          PDPR(I)=0.0
141          V(I)=0.0
142      150 VPR(I)=0.0
143      C
144      C      INITIALIZE DATA CELLS FOR NEXT CASE.
145      C
146      THSLV=0.0
147      THSLVV=0.0
148      ANIB0=0.0
149      ASLVR=0.0
150      TAU =0.0
151      VRX =0.0
152      ALIIO=0.0
153      COUNT=0.0
154      VFHEWI=0.0
155      VSTR=0.0
156      VSTO=0.0
157      VEX=0.0
158      VR=0.0
159      ASTO=0.0
160      RC=0.0
161      SUMDV=0.0
162      XR=0.0
163      DV=0.0
164      HE=0.0
165      DO 160 I=1,5
166          SINA(I)=0.0
167          COSA(I)=0.0
168          AV1 = 0.0
169          AV2 = 0.0

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167      AV3 = 0.0
168      BV1M=0.0
169      DO 170 I=1,45
170      AX(I) = 0.0
171      170 AY(I) = 0.0
172      DO 180 I=1,18
173      UA(I) = 0.0
174      UF(I) = 0.0
175      WSLTD(I)=0.0
176      WSLTI(I)=0.0
177      AFRPL(I)=0.0
178      180 ALPHP(I)=0.0
179      DO 200 I=1,101
180      DO 200 J=1,15
181      200 PRNT(I,J)=0.0
182      DELT=0.0
183      TAU0Z=0.0
184      RSLVRN=0.0
185      BVXX=0.0
186      ACCEL=0.0
187      VSLVR=0.0
188      HNNOUT=0.0
189      AKHST=0.0
190      KRASUB=0
191      KXRSUB=0
192      LSWIT1=0
193      KWI1=0
194      KWI2=0
195      KBRAX=0
196      KGAM=0
197      KRASHB=0
198      KXSHB=0
199      KVSTR=0
200      III=0
201      IIJ=0
202      NI=0
203      290 NTEST =0
204      NTEST4=0
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      C      DETERMINE VALIDITY OF TIME INPUTS
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
205      IF(AINCIN(1).EQ.0.0) GO TO 360
206      WRITE(6,350) AINCIN(1)
207      350 FORMAT(14H0INVALID AINC ,5X,8HAINC = E20.7/63H0(AINC HAS BEEN IN
      XPUT NON-ZERO. AINC MUST BE INPUT AS ZERO.)/45H0ABOVE ERROR OCCUR
      XRED AT STATEMENT NUMBER 350)
208      GO TO 970
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
209      360 IF(AINCIN(KPLANE).EQ.HCO) GO TO 400
210      WRITE(6,1) AINCIN(KPLANE),HCO
211      1 FORMAT(/15X,24HINVALID AINCIN(KPLANE) =,1PE14.7,5X, 'LAST VALUE 0
      IF AINCIN MUST BE THE SAME AS HCO =',E14.7/35X,'ABOVE ERROR OCCURED
      2 AT STATEMENT NUMBER 360 IN SUBROUTINE MNCHN1')
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
      C      NUMBER OF PLANES IS EQUAL TO KPLANE. DETERMINE VALIDITY

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I N D E X

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C      OF SLOT INTERFACE LOCATIONS AND NUMBER OF SLOTS.          17640
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 17660
212  400 IF(SA(1)-HCO)420,430,410
213  410 I=1                                                         17690
214      GO TO 530                                                  17700
215      420 IF(SA(1)-GECON(38,1))430,450,450
216      430 WRITE(6,440) SA(1)
217  440 FORMAT(12H0INVALID SA1,5X,6HSA1 = E20.7/90H0(SA1 IS EQUAL TO HCO 0 17730
      XR LESS THAN TAUM . SA1 CANNOT BE LESS THAN TAUM OR EQUAL TO HCO. 17740
      X)/53H0ABOVE ERROR OCCURRED AT STATEMENT NUMBER 400 OR 420.)
218      BYEBYE=1.0                                                17760
219      450 DO 520 I=1,18
220          IF(SCUR(I,1)-10.E+36)460,530,530                      17780
221      460 IF(SCUR(I,2)-SCUR(I,1))470,490,490                      17790
222      470 WRITE(6,480)I,I,SCUR(I,2),I,I,I
223  480 FORMAT(10H0INVALID S,I2,1H8,5X,1H8,I2,2H8=E20.7/6H0SLOT ,I2,60HFOR 17810
      XWARD INTERFACE IS GREATER THAN AFT INTERFACE LOCATION. S,I2,21H8 17820
      XMUST BE LESS THAN S,I2,2H8./46H0ABOVE ERROR OCCURRED AT STATEMENT 17830
      XNUMBER 430.)
224      BYEBYE=1.0                                                17840
225      GO TO 520                                                  17850
226  490 IF(SCUR(I+1,1)-SCUR(I,2))500,500,520                      17860
227      500 K = I + 1                                              17870
228      WRITE(6,510)K,K,SCUR(K,1),K,I,K,K                        17880
229  510 FORMAT(10H0INVALID S,I2,1H8,5X,1H8,I2,2H8=E20.7/6H0SLOT ,I2,37H 17890
      XWARD INTERFACE IS LESS THAN SLOT ,I2,18H AFT INTERFACE. S,I2,24H 17900
      XA MUST BE GREATER THAN S,I2,2H8./46H0ABOVE ERROR OCCURRED AT STATE 17910
      XMENT NUMBER 450.)
230      BYEBYE=1.0                                                17920
231      520 CONTINUE                                              17930
232      530 IF(I.LT,18) NSLOT= I-1                                17940
233      NSLOT=AMAX0(NSLOT,1)                                       17950
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 17970
C      SLOT INPUTS 1 THROUGH NSLOT-1 ARE VALID AND NUMRER        17990
C      OF SLOTS IS EQUAL TO NSLOT. DETERMINE LOCATION OF          18010
C      INCREMENT DIVIDING PLANES.                                  18020
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 18030
C      PLACE AN I.D.P. AT AINCPL,EACH REF.PLANE,EACH SLOT INTERFACE 18050
C      AND AT DELZ INTERVALS FROM THE CURRENT ONE OF THESE.      18070
C                                                                    18080
C      NI INDEX ON CURRENT INCREMENT DIVIDING PLANES              18090
C      JJ INDEX ON NEXT DOWNSTREAM REFERENCE PLANE                 18100
C                                                                    18110
234      NI=1                                                        18120
235      ANI=1.0                                                      18130
236      ZCALC(1)=0.0                                                  18140
237      IIS=1                                                         18150
238      JJ=2                                                         18160
239      540 NI = NI + 1                                              18180
240      ANI=ANI+1.0                                                  18190
C      SET UP TENTATIVE I.D.P.                                     18200
241      ZCALC(NI)=ZCALC(NI-1)+DELZ                                  18210
C      HAS AFT TANGENT PLANE BEEN REACHED                          18220
242      IF(JJ-KPLANE)544,541,542
243      541 IF(ZCALC(NI)-AINCIN(KPLANE))544,610,542

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244      542 ZCALC(NI)=AINCIN(KPLANE)
245      GO TO 610
246      C      IS THERE AN AVISOTROPIC BURN-RATE CALCULATION REFERENCE DISTANCE
247      544 IF(AINCPL1545,564,545
248      C      IF THIS DISTANCE IS CLOSE TO A R.P.,USE REF.DISTANCE
249      545 IF(ABS(AINCIN(JJ)-AINCPL)-.01)546,546,548
250      546 JJ = JJ + 1
251      C      IS AINCPL ENCOUNTERED BEFORE THE NEXT SLOT OR R.P.
252      548 IF(AINCPL-AMINI(AINCPL,SCUR(IIS,1)))550,550,564
253      C      IS AINCPL WITHIN THIS DELZ INTERVAL
254      550 IF(ZCALC(NI)-AINCPL)540,552,552
255      552 ZCALC(NI)=AINCPL
256      NINCPL=NI
257      AINCPL=0.0
258      GO TO 540
259      C      IF SLOT AND R.P. ARE VERY CLOSE, USE SLOT
260      564 IF(ABS(AINCIN(JJ)-SCUR(IIS,1))-.01)565,565,568
261      565 JJ = JJ + 1
262      GO TO 570
263      C      WHICH IS ENCOUNTERED FIRST SLOT OR R.P.
264      568 IF(AINCIN(JJ)-SCUR(IIS,1))590,570,570
265      C      IS SLOT WITHIN THIS DELZ INTERVAL
266      570 IF(SCUR(IIS,1)-ZCALC(NI))572,572,540
267      572 ZCALC(NI)=SCUR(IIS,1)
268      NI=NI+1
269      ANI=ANI+1.0
270      C      IS THERE A R.P. IN THE SLOT
271      IF(AINCIN(JJ)-SCUR(IIS,2))574,576,576
272      C      YES
273      574 ZCALC(NI)=AINCIN(JJ)
274      JJ = JJ + 1
275      NI=NI+1
276      ANI=ANI+1.0
277      C      NO
278      576 ZCALC(NI)=SCUR(IIS,2)
279      IIS=IIS+1
280      GO TO 540
281      C      R.P. ENCOUNTERED BEFORE SLOT. IF R.P. CLOSE TO I.D.P.,USE R.P.
282      590 IF(ABS(AINCIN(JJ)-ZCALC(NI))-.01)594,595,592
283      C      IS R.P. WITHIN THIS DELZ INTERVAL
284      592 IF(AINCIN(JJ)-ZCALC(NI))595,595,540
285      594 ZCALC(NI)=AINCIN(JJ)
286      595 JJ = JJ + 1
287      IF(ZCALC(NI).GE.AINCIN(KPLANE)) GO TO 600
288      GO TO 540
289      600 ZCALC(NI)=AINCIN(JJ)
290      510 IF(100-NI)620,640,640
291      520 WRITE(6,630)DELZ
292      GO TO 970
293      630 FORMAT(14H0INVALID DELZ.,5X,5H0DELZ=E20.7/73H0DELZ HAS RESULTED IN
294      XMORE THAN 100 INCREMENTS. INCREASE DELZ FOR RERUN./46H0ABOVE ERRO
295      XR OCCURRED AT STATEMENT NUMBER 560.)
296      C      THE TOTAL NUMBER OF INCREMENT DIVIDING PLANES IS LESS
297      C      THAN OR EQUAL TO 100. CALL SUBROUTINES TO COMPUTE

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C      CYLINDRICAL SECTION PLANE CONSTANTS AND TO PRINT      18800
C      DATA VALUES AND ERROR COMMENTS.                     18810
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 18830
282      640 IF(NGEO(1))660,660,650
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 18870
C      GEOMETRY HAS BEEN INPUT OR THIS IS A MULTIPLE CASE, 18890
C      LOAD CHAIN 4.                                          18900
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 18920
283      650 ICHN=4                                           18940
284      60 TO 980                                           18950
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 18970
C      GEOMETRY HAS NOT BEEN INPUT FOR THE FIRST CASE OR GEOMTRY 18990
C      IS TO BE REVISED FOR NEXT CASE. DETERMINE PLANE CONSTANTS. 19000
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19020
285      660 WRITE(6,655)
286      655 FORMAT('1')
287      DO 700 IPLANE=1,KPLANE
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19050
C      MOVE AINCX TO AINC                                     19070
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19090
288      DO 670 I=1,21                                         19110
289      J=(I-1)*18 + IPLANE
290      AINC(I)=AINCIN(J)
291      670 CONTINUE                                           19140
292      WRITE(6,680) IPLANE,AINC(I)
293      680 FORMAT(/,10X,'LOCATION OF PLANE ',I2,2X,IPE13.6)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19180
C      CALL SUBROUTINES PLNCNS, AND PLNLCS TO COMPUTE        19200
C      PLANE CONSTANTS AND TO PRINT DATA VALUES AND ERROR 19210
C      COMMENTS FOR PLANE (IPLANE).                          19220
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19240
294      THO = THO(IPLANE)
295      CALL PLNCNS                                           19280
296      CALL PLNLCS(IEERRR)                                   19290
297      IF(IEERRR.EQ.1)BYEBYE=1.0                             19300
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19320
C      MOVE A TO GEOCON
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19360
298      DO 690 I=1,45                                           19380
299      690 GEOCON(I,IPLANE) = A(I)
300      700 CONTINUE                                           19410
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19430
C      INITIALIZE NOZZLE PLANE CONSTANTS TO LAST REFERENCE 19450
C      PLANE (KPLANE) VALUES AND DETERMINE HEAD END AND    19460
C      NOZZLE END CONSTANTS.                                  19470
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19490
301      710 WRITE(6,720)                                       19510
302      720 FORMAT(9H0HEAD END)                                19520
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19540
C      MOVE AINC TO AINCN
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19560
303      DO 730 I=1,21                                         19580
304      730 AINCN(I)=AINC(I)                                   19600
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19610
C      MOVE A TO AN                                           19630

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305      DO 740 I=1,45
306      740  AN(I)=A(I)
307      IF(BTAE)770,770,750
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19670
      C FORWARD DOME HAS A FULL WEB.
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19690
      750  WRITE(6,760)BH,BTAE,RIG
      760  FORMAT(3H0BH,12X,5HBTADE,10X,3HRIG/1X,3(1PE15,7))
308      770  DO 780 I=1,21
309      GO TO 840
310      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19700
      C MOVE AINCA TO AINC
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19730
      780  AINC(I)=AINCIN(I)
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19750
      C MOVE AA TO A
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19770
      DO 790 I=1,45
314      790  A(I)=GEOCON(I,1)
315      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19790
      C FORWARD DOME IS A STRAIGHT THROUGH WEB. DETERMINE
      C HEAD END CONSTANTS
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19800
      C INITIALIZE END CONSTANTS SUBROUTINE TO HEAD END VALUES
      C AND SOLVE FOR CONSTANTS.
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19810
      DE1=DH1
316      HE=HH
317      AOEM=AOHM
318      NTAE=NGEOHD
319      NEND=1
320      CALL ENDCSB(IEKRD)
321      IF(VCHINP,GT.0.0)VFE0=VF40
322      IF(IEKRD,GT.0.0)BYE=1.0
323      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19820
      C MOVE ENDCSB VARIABLES TO HEAD END
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19830
      800  DO 810 I=1,20
324      810  HH1(I)=RE1(I)
325      IF(VCHINP)830,830,820
326      820  VCH=VCHINP
327      830  VFH0=VFEO
328      840  WRITE(6,850)
329      850  FORMAT(11HNOZZLE END)
330      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19840
      C INITIALIZE ENDCSB VARIABLES TO NOZZLE VALUES.
      C
      C MOVE AINCN TO AINC.
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19850
      DO 860 I=1,21
331      860  AINC(I)=AINCIN(I)
332      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 19860
      C MOVE AN TO A

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	CC	20580
333	DO 870 I=1,45	20600
334	870 A(I)=AN(I)	20610
335	DE1=DN1	20620
336	BE=BN	20630
337	AOEM=AONM	20640
338	NFAE=NGEOMN	20650
339	NEND=2	
	CC	20670
	C SOLVE FOR END CONSTANTS AND PRINT DATA VALUES.	20690
	CC	20710
340	CALL ENDCSB(IERROR)	20730
341	IF(IERROR.EQ.1)BYEBYE=1.0	20750
	CC	20770
	C MOVE ENDCSB VARIABLES TO NOZZLE END.	20790
	CC	20810
342	880 DO 890 I=1,20	20830
343	890 RN1(I)=RE1(I)	20840
344	IF(VCNINP.EQ.0.0) GO TO 915	
345	VCN=VCNINP	
346	IF(NSUHMGEQ.0) GO TO 920	
347	VCNA=VCNINA	
348	VCNH=VCNINB	
349	GO TO 920	
350	915 VCN=VCE	
351	VFNU=SUMDV	
352	IF(NSUBMG.EQ.0) GO TO 920	
353	VFNUA=SUMDVA	
354	VFNUB=SUMDVB	
355	920 IF(HCO-SCUR(1,1))940,930,930	20880
356	930 IF(HCO-SCUR(NSLOT,2)-AN(38))940,960,960	
357	940 IF(SLTBRN(NSLOT).EQ.2.0 .OR. SLTBRN(NSLOT).EQ.3.0) GO TO 960	
358	WRITE(6,950) NSLOT,NSLOT,SH(NSLOT),NSLOT,NSLOT	
359	950 FORMAT(12,'INVALID S',I2,'B',5X,'S',I2,'B',E20.7/T2,'(HCO-S',I2, 'IS LESS THAN TAUMN'/T2,'SLOT ',I2,'AFT INTERFACE CANNOT BE WIT \$HIN TAUMN OF THE AFT TANGENT PLANE WHEN THE INTERFACE IS NOT INHIN \$ITEU',/T2,'ERROR OCCURED IN MNCHN1 AT STATEMENT 930') BYEBYE=1.0	20950
360	CC	20970
	C PRINT THE PROGRAM INPUTS FOR THE PROPERTIES OF THE	20990
	C PROPELLANT AND THE BURNING RATE EQUATION CONSTANTS.	21000
	CC	21020
361	960 ICHN=2	21050
	CC	21070
	C CHECK THE VALIDITY OF THE BURNING RATE EQUATION CONSTANTS	21090
	C AND PRINT APPROPRIATE DIAGNOSTIC COMMENTS.	21100
	CC	21120
362	CALL RBVSUB	21140
363	IF(BYEBYE.LT.1.0)GO TO 980	21150
364	970 BYEBYE=0.0	21160
365	IERROR=0	21170
366	ICHN=5	21180
367	980 RETURN	21190
368	END	

SYMBOL	-----	REFERENCES	-----
1	- 210WR 211*		
10	- 7900 81*		
11	- 10000 101*		
20	- 77 82*		
30	- 82 85*		
50	- 86*		
60	- 86 87*		
70	- 87WR 88*		
80	- 86 90*		
110	- 93*		
115	- 9300 9500 96*		
140	- 92 133*		
150	- 13300 142*		
160	- 16200 164*		
170	- 16900 171*		
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680	-	292WR	293*	
690	-	29800	299*	
700	-	28700	300*	
710	-	301*		
720	-	301WR	302*	
730	-	30300	304*	
740	-	30500	306*	
750	-	307	308*	
760	-	308WR	309*	
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780	-	31100	313*	
790	-	31400	315*	
800	-	324*		
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820	-	326	327*	
830	-	326	328*	
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950	-	358WR	359*	
960	-	355	356	357 361*
970	-	89	208	280 364*
980	-	284	363	367*
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1016	-	11000	116	125*
1020	-	109	126*	
1040	-	12800	131*	
1050	-	12600	127	132*
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AAN	-	58C0		
AANN	-	59C0		
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AP	-	53C0			
APA	-	37C0			
APF	-	37C0			
APHI	-	31C0			
APORT	-	8C0			
APX	-	41C0			
APY	-	41C0			
ARCO	-	59C0			
ARCI	-	59C0			
AS	-	63C0			
ASE	-	45C0			
ASEA	-	72C0			
ASEB	-	72C0			
ASI	-	45C0			
ASII	-	59C0			
ASLVR	-	41C0	146=		
ASTO	-	46C0	156=		
AT	-	57C0			
AV1	-	50C0	165=		
AV2	-	50C0	166=		
AV3	-	51C0	167=		
AW	-	21C0			
AwE	-	42C0			
AX	-	39C0	170=		
AY	-	39C0	171=		
AZ	-	44C0			
A1E	-	59C0			
BA	-	28C0			
BAP	-	26C0			
BB	-	29C0			
BBP	-	27C0			
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BN	-	10C0	336		
BU	-	30C0			
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BRAK	-	63C0			
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BTA0B	-	29C0			
BTA0BP	-	27C0			
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BVXX	-	52C0	185=										
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BV2	-	51C0											
BV2M	-	51C0											
BX	-	59C0											
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B1E	-	59C0											
B71	-	54C0											
B71M	-	20C0											
B72M	-	20C0											
B91	-	54C0											
B91M	-	20C0											
B92M	-	20C0											
CA	-	28C0											
CAE	-	23C0											
CAP	-	26C0											
CB	-	29C0											
CBE	-	23C0											
CBP	-	27C0											
CCCE	-	23C0											
CCVE	-	23C0											
CDCE	-	23C0											
CDVE	-	23C0											
CECE	-	23C0											
CEVE	-	23C0											
CFO	-	62C0											
CFOL	-	62C0											
CKTIME	-	19C0											
CLOPS	-	62C0											
CO	-	30C0											
* COMA	-	31*											
* COMB	-	32*											
* COMC	-	33*											
* COME	-	34*											
* COMG	-	35*											
* COMH	-	36*											
* COMJ	-	37*											
* COML	-	38*											
* COMM	-	39*											
* COMN	-	40*											
* COMO	-	41*											
* COMP	-	42*											
* COMQ	-	43*											
* COMR	-	44*											
* COMT	-	45*											
* COMU	-	46*											
* COMV	-	47*											
* COMW	-	48*											
* COMX	-	49*											
* COMY	-	50*											
* COMZ	-	51*											
* CONSTS	-	4*											
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COSGB2	-	29C0			
COSGM1	-	30C0			
COSGM2	-	30C0			
COSTHR	-	30C0			
COSTRA	-	28C0			
COSTRB	-	29C0			
COUNT	-	46C0	150=		
CRP	-	14C0			
CRT	-	14C0			
CRW	-	14C0			
CTRAP	-	26C0			
CTRBP	-	27C0			
JA	-	28C0			
UAP	-	26C0			
UB	-	29C0			
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UEEU	-	62C0			
UELF	-	16C0			
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UELLRI	-	59C0			
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DELTA	-	57C0			
DELTSS	-	12C0			
DELTST	-	12C0			
DELTTO	-	12C0			
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DEL3	-	54C0			
DEL7	-	54C0			
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UNI	-	10C0	335		
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DPSA	-	65C0			
DS	-	63C0			
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DTAUX	-	49C0			
DTINT	-	32C0			
DUMX	-	39C0			
DUMY	-	39C0			
* DUMYC	-	18*			
* DUMYM	-	19*			
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JJ	-	238=	242	247	248=	255	256=	258	263	264	265=	271	272	271	
		274=	277												
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KBRAC	-	63C0	195=												
KDUMP	-	16C0													
KGAM	-	66C0	196=												
KMOICG	-	13C0													
KPLANE	-	13C0	209	210WR	242	243	244	275	28700						
KRASBB	-	66C0	197=												
KRASUB	-	55C0	190=												
KVSTR	-	63C0	199=												
KWIT1	-	56C0	193=												
KWIT2	-	56C0	194=												
KXRSBB	-	66C0	198=												
KXRSUB	-	55C0	191=												
LSWIT1	-	56C0	192=												
* MNCHN1	-	1*													
NCASE	-	3C0	82	91											
NCASES	-	3C0													
NCONT	-	75C0													
NDISP	-	3C0													
NEND	-	72C0	320=	339=											
NF	-	3C0													
NGEO	-	8C0	92	101=	127	282									
NGEODH	-	8C0	102	319											
NGEOMN	-	8C0	109	338											
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		264	266=	268	271	272	273	275	277	27A					
NINCPL	-	53C0	252=												
NLEWIS	-	3C0													
NPSBM1	-	78=	79D0												
NPSUB	-	74C0	78												
NRECON	-	3C0													
NSI	-	3C0													
NSLOT	-	53C0	232=	233=	356	357	358WR								
NSUBMG	-	72C0	77	116	346	352									
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NTEST	-	18C0	203=												
NTEST4	-	19C0	204=												
NTME	-	53C0													
OAP	-	26C0													
OBP	-	27C0													
P	-	57C0													
PA	-	16C0													
* PARMA	-	52*													
* PARMAB	-	72*													
* PARMAD	-	73*													
* PARMAG	-	74*													
* PARMAH	-	75*													
* PARMAI	-	76*													
* PARMB	-	53*													
* PARMC	-	54*													
* PARMD	-	55*													

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*	PARME	-	56*	
*	PARMF	-	57*	
*	PARMG	-	58*	
*	PARMH	-	59*	
*	PARMI	-	60*	
*	PARMJ	-	61*	
*	PARMK	-	62*	
*	PARML	-	63*	
*	PARMM	-	64*	
*	PARHN	-	65*	
*	PARNO	-	66*	
*	PARNP	-	67*	
*	PARNU	-	68*	
*	PARNS	-	69*	
*	PARMU	-	70*	
*	PARMV	-	71*	
	PD	-	35C0	139=
	PDPH	-	36C0	140=
	PEPO	-	62C0	
	PEPO1	-	48C0	83=
	PH	-	57C0	
	PHI	-	16C0	
	PI	-	4C0	80
	PI02	-	4C0	
*	PLNCNS	-	295*	
*	PLNLCS	-	296*	
	PHAX	-	53C0	
	PHIN	-	53C0	
	PMOIH0	-	8C0	106=
	PMOIN	-	8C0	113=
	PMOINA	-	73C0	119=
	PMOINB	-	73C0	120=
	POA	-	37C0	
	POF	-	37C0	
	PON	-	57C0	
	PRNT	-	31C0	181=
	PSA	-	37C0	
	PSF	-	37C0	
	RA	-	45C0	
	RAA	-	28C0	
	RAAP	-	26C0	
	RAB	-	29C0	
	RABP	-	27C0	
	RADIAN	-	4C0	
	RAMIN	-	42C0	
	RAO	-	45C0	
	RAT	-	64C0	
	RB	-	35C0	
	RBHI	-	41C0	
*	RBYSUB	-	362*	
	RBZ	-	35C0	135=
	RBZTO	-	35C0	137=
	RC	-	45C0	157=
	RCG	-	56C0	
	RCGO	-	34C0	

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* RETURN	=	367*		
RE1	=	23C0	325	343
RE2	=	23C0		
RF	=	5C0		
RFD0	=	21C0		
RFH1	=	41C0		
RFX	=	39C0		
RFY	=	39C0		
RGYP	=	68C0		
RH1	=	24C0	325=	
RIG	=	9C0	308WH	
RM01HD	=	8C0	107=	
RM01N	=	8C0	114=	
RM01NA	=	73C0	121=	
RM01NB	=	73C0	122=	
RN1	=	25C0	343=	
ROE1	=	59C0		
ROPE1	=	47C0		
ROPE2	=	47C0		
ROPE3	=	47C0		
ROPE4	=	59C0		
RPX	=	63C0		
RP2	=	44C0		
RP1	=	67C0		
RP10	=	67C0		
RP11	=	67C0		
RP12	=	67C0		
RP13	=	67C0		
RP2	=	67C0		
RP3	=	67C0		
RP4	=	67C0		
RP5	=	67C0		
RP6	=	67C0		
RSLVRN	=	39C0	184=	
RSLVRV	=	51C0		
RT	=	42C0		
RV1	=	50C0		
RV2	=	50C0		
RV3	=	50C0		
RV4	=	50C0		
RV5	=	51C0		
RV7	=	51C0		
RXX	=	59C0		
R011	=	20C0		
R03	=	20C0		
R05	=	20C0		
R07	=	20C0		
R09	=	20C0		
R1	=	20C0		
R2	=	5C0		
R2DM	=	21C0		
R3	=	5C0		
R3DM	=	21C0		
R4	=	5C0		
R4DM	=	21C0		

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R5DM	-	21C0												
R6	-	5C0												
R6DM	-	21C0												
R7	-	5C0												
R7DM	-	21C0												
R8	-	5C0												
R8DM	-	21C0												
R9	-	20C0												
SA	-	15C0	212	215	216WR									
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SCUR	-	53C0	220	221	222WR	226	228WR	249	255	258	259	260	263	268
		355	356											
SINA	-	49C0	163=											
SINGA1	-	28C0												
SINGA2	-	28C0												
SINGB1	-	29C0												
SINGB2	-	29C0												
SINGM1	-	30C0												
SINGM2	-	30C0												
SINTHR	-	30C0												
SINTRA	-	28C0												
SINTRB	-	29C0												
SIRATC	-	75C0												
SLTHRN	-	15C0	357											
SOAP	-	26C0												
SOBP	-	27C0												
SPHDT	-	58C0												
SPOND1	-	58C0												
STDYST	-	12C0												
STFLAG	-	12C0												
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SUMDVH	-	72C0	354											
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TANG2A	-	28C0												
TANG2B	-	29C0												
TANPH1	-	30C0												
TANP1A	-	28C0												
TANP1B	-	29C0												
TAU	-	45C0	147=											
TAUAO	-	32C0												
TAUEO	-	23C0												
TAUE1	-	23C0												
TAUHD	-	8C0	104=											
TAUM	-	20C0												
TAUN	-	8C0	111=											
TAUPL	-	8C0	129=											
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TAUTOV	-	52C0												
TAUTOZ	-	39C0	183=											

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TAUW	-	500	
TAUWDM	-	2100	
TAUWDP	-	3500	138=
TAUWEI	-	3400	
TAUWX	-	3900	
TAUWY	-	3900	
TAUZ	-	3500	134=
TAUZTO	-	3500	136=
TDMAX	-	4700	
TG2AP	-	2600	
TG2BP	-	2700	
THETEX	-	7500	
TH0	-	600	294
THR	-	6400	
THRA	-	2800	
THRAP	-	2600	
THRH	-	2900	
THRBP	-	2700	
THRI	-	5900	
THRU	-	5900	
THRZ	-	6700	
THSLV	-	4100	143=
THSLVV	-	4100	144=
THV	-	5100	
TH0	-	3800	294=
TH1	-	2000	
TH2	-	2000	
TH3	-	2000	
TH4	-	2000	
TIME	-	5700	
TIMECK	-	1800	
TIMEW	-	3100	
TOFLAG	-	5300	
TP1BP	-	2700	
TRSUB	-	7400	80
TSA	-	3700	
TSF	-	3700	
TSLVDM	-	4100	
TSLVR	-	600	
TSLVRX	-	4000	
TSLVRY	-	4000	
TV2	-	5000	
TV4	-	5000	
TV5	-	5000	
TV6	-	5000	
TV7	-	5000	
TXSUB	-	7400	80
T10M	-	2000	
T12M	-	2000	
T2M	-	2000	
T4M	-	2000	
T5M	-	2000	
T6M	-	2000	
T7M	-	2000	
T9M	-	2000	

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UA	-	37C0	173=	
UF	-	37C0	174=	
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V	-	36C0	141=	
VCE	-	23C0	350	
VCH	-	24C0	327=	
VCHINP	-	11C0	322	326 327
VCN	-	25C0	345=	350=
VCNA	-	76C0	347=	
VCNB	-	75C0	348=	
VCNINA	-	17C0	347	
VCNINB	-	17C0	348	
VCNINP	-	11C0	344	345
VEH	-	58C0		
VEX	-	46C0	154=	
VF	-	35C0		
VFEO	-	23C0	322=	328
VFH	-	58C0		
VFHEWI	-	46C0	151=	
VFHO	-	24C0	322	328=
VFINT	-	58C0		
VFN	-	58C0		
VFNA	-	76C0		
VFNB	-	76C0		
VFNO	-	25C0	351=	
VFNOA	-	17C0	353=	
VFNOB	-	17C0	354=	
VFPP	-	39C0		
VFWEb	-	62C0		
VIS	-	58C0		
VNOZSB	-	75C0	80=	
VP	-	35C0		
VPH	-	60C0		
VPN	-	60C0		
VPR	-	36C0	142=	
VR	-	46C0	155=	
VRX	-	46C0	148=	
VSLVR	-	41C0	187=	
VSTO	-	47C0	153=	
VSTR	-	47C0	152=	
WD	-	62C0		
WDOT	-	53C0		
WDOTD	-	53C0		
WDOTI	-	31C0		
WF	-	71C0		
WGTOT	-	62C0		
WI	-	45C0		
* WORKA	-	21*		
* WORKDE	-	22*		
* WORKRE	-	23*		
* WORKRH	-	24*		
* WORKRN	-	25*		
* WORK45	-	20*		
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WT	-	45C0	
WTH	-	61C0	
XBARI	-	55C0	
XBARIH	-	45C0	
XBARIN	-	56C0	
XBM	-	32C0	
XBIH	-	33C0	
XBN	-	32C0	
XCGA	-	34C0	
XCGB	-	34C0	
XCGHD	-	8C0	108=
XCGN	-	8C0	115=
XCGNA	-	73C0	123=
XCGNB	-	73C0	124=
XMAX	-	47C0	
XO	-	30C0	
XOA	-	28C0	
XOAP	-	26C0	
* XOAPW	-	26*	
* XOAWOR	-	28*	
XOB	-	29C0	
XOBP	-	27C0	
* XOBPW	-	27*	
* XOBWOR	-	29*	
* XOWORK	-	30*	
XPZ	-	44C0	
XP1	-	67C0	
XP11	-	67C0	
XP13	-	67C0	
XP3	-	67C0	
XP5	-	67C0	
XR	-	45C0	159=
XHAT	-	64C0	
XRA1A	-	28C0	
XRA1AP	-	26C0	
XRA1B	-	29C0	
XRA1BP	-	27C0	
XV7	-	50C0	
X011	-	20C0	
X03	-	20C0	
X05	-	20C0	
X07	-	20C0	
X09	-	20C0	
X1	-	30C0	
X1A	-	28C0	
X1AP	-	26C0	
X1B	-	29C0	
X1BP	-	27C0	
X2	-	30C0	
X2A	-	28C0	
X2AP	-	26C0	
X2B	-	29C0	
X2BP	-	27C0	
X3	-	30C0	

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X3B	-	29C0												
X45	-	20C0												
X76	-	20C0												
YCG	-	34C0												
YI	-	34C0												
YMAX	-	47C0												
Y0	-	30C0												
Y0A	-	28C0												
Y0AP	-	26C0												
Y0B	-	29C0												
Y0BP	-	27C0												
YPI	-	59C0												
YPO	-	63C0												
YRO	-	34C0												
Y011	-	20C0												
Y03	-	20C0												
Y05	-	20C0												
Y07	-	20C0												
Y09	-	20C0												
Y1	-	30C0												
Y1A	-	28C0												
Y1AP	-	26C0												
Y1B	-	29C0												
Y1BP	-	27C0												
Y2	-	30C0												
Y2A	-	28C0												
Y2AP	-	26C0												
Y2B	-	29C0												
Y2BP	-	27C0												
Y3	-	30C0												
Y3A	-	28C0												
Y3B	-	29C0												
Y45	-	20C0												
Y76	-	20C0												
ZCALC	-	31C0	236=	241=	243	244=	250	251=	259	260=	264=	268=	271	272
		273=	275	277=										
ZCG	-	34C0												
ZI	-	59C0												
ZMAX	-	47C0												
Z0	-	30C0												
Z0A	-	28C0												
Z0AP	-	26C0												
Z0B	-	29C0												
Z0BP	-	27C0												
ZPO	-	63C0												
ZPI	-	59C0												
ZRO	-	34C0												
Z1	-	30C0												
Z1A	-	28C0												
Z1AP	-	26C0												
Z1AT	-	64C0												
Z1B	-	29C0												
Z1BP	-	27C0												
Z2	-	30C0												

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 Z2AP - 26C0
 Z2B - 29C0
 Z2BP - 27C0
 Z3 - 30C0
 Z3A - 28C0
 Z3B - 29C0

```

1      SUBROUTINE MNCHN2                                21210
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 21960
C      SUBROUTINE MNCHN2 IS THE CONTROL ROUTINE
C      WHICH DETERMINES THE INITIAL FUEL AREA (AFF) AND PORT AREA (AP) 21990
C      FOR THE CYLINDRICAL SECTION REFERENCE PLANES AND DETERMINES THE 22000
C      BURN AREA AND INITIAL FUEL VOLUME OF THE STRAIGHT THROUGH CHAIN 22010
C      FORE-HEAD AND AFT-HEAD SECTIONS AS A FUNCTION OF DISTANCE BURNED. 22020
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 22040
2      COMMON/CONST/ GNOT,PI,PI02,RADIAN
3      COMMON/INPUT1/ AINCIN(18),ANO(18),HF(18),TAUW(18),R2(18),
1          R3(18),R4(18),R5(18),R6(18),R7(18),R8(18),
2          ALS1(18),ALSP(18),ALA(18),ALB(18),ALE(18),A01(18),
3          A02(18),A03(18),A04(18),A05(18)
4      COMMON/INPUT2/ TH0(18),TSLVR(18)
5      COMMON/INPUT3/ GEOCON(45,18)
6      COMMON/INPUT4/ NGE0(18),APORT(18),TAUPL(50,18),ALPPL(50,18),
1          AKGYP(50,18),TAUHD(50),ABHD(50),PMOHD(50),
2          RMOHD(50),XCGHD(50),TAUN(50),ABN(50),PMOIN(50),
3          RMOIN(50),XCGN(50),NGEHD,NGEOMN
7      COMMON/INPUTA/ BTAOE,DH1,BH,ADHM,RIG,HHR
8      COMMON/INPUTB/ AONM,BN,DNI
9      COMMON/INPUTC/ AK,AKK,DLRF,DRVRF
10     COMMON/INPUTD/ KPLANE,KMOIC
11     COMMON/INPUTS/ DTAU(18),DTAUW(18)
12     COMMON/INPUTU/ DELF,PA,PHI,HCO,DELZ,KDUMP(72)
13     COMMON/INPUTV/ VFNOA,VFNCH,VCNINA,VCNINH
14     COMMON/INPUTW/ TAUMNA,TAUMIR
15     COMMON/WORK45/ A151,R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3          TH3,TH4,B71M,B72M,B91M,B92M
16     COMMON/WORKA/ AINC(1),ANODM,RFDM,TAUDM,R2DM,R3DM,R4DM,R5DM,R6DM,
1          R7DM,R8DM,ALS1DM,ALS2DM,ALADM,ALBDM,ALFDM,AW(5)
17     COMMON/WORKDE/ DE1,HE,AOE
18     COMMON/WORKRE/ RE1,ALFEM,ALFE,RE2,HE1,HE2,HE3,HER,VFE0,VCE,
1          TAU0,TAUE1,CAE,CBE,CCCE,CCVE,CDCE,C0VE,CECE,CFVE
19     COMMON/WORKRH/ RH1(5),HH2,ACG,HHW,VFHD,VCH,ANK(10)
20     COMMON/WORKRN/ RN1(8),VFND,VCN,ACK(10)
21     COMMON/COMB/ AHH,AJPHN,AJ3HN,TAUA0,AJPHED,AJRHED,AJPN07,AJRV07,
1          X3H,XBN,DTINT
22     COMMON/COMC/ AMTJ,AMTI,AJPH0,AJBHO,XB1H,AL0
23     COMMON/COMD/ BHOLD,RHOLD,RGF,RGI,XBAHST,AJSTP,AJSTB,WTST,
1          RGF8,RGI8
24     COMMON/COML/ TH0X
25     COMMON/COMO/ THSLV,TSLVDM,THSLVV,ASLVR,AH0,RFHI,ALPX,APX,
1          RBHI,ALPY,APY,VSLVR
26     COMMON/COMT/ TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,
1          RAO,ALL,AJPP,ASI
27     COMMON/COMX/ COSA(5),SINA(5),DTAUX,DTAUW
28     COMMON/PARMA/ APF,AL7,AL8,TAUTOV,BVX,BVXX
29     COMMON/PARMB/ AP,PMIN,P4AX,WOOT,III,IIJ,WOOTD,NSLDT,NTABE,NIME,
1          TAUTO,TOFLAG,NINCP,BRNDUT,IIS,IS1,IS2,N1,SCUR(18,2)
30     COMMON/PARMD/ KRASUB,KXRSUB,4JBB,HEI,AJBN,AJBH,XBARI
31     COMMON/PARMF/ PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
1          AMW,AKRST

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[Faint, illegible handwritten notes]

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76      NEND=2
77      CALL TRAN(RN),RE1,20)
78      NTABE=NGEOMN
79      NGEOM=NGEOMX
80      GO TO 360
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 22680
      C      DETERMINE FUEL AREA, AFF, AND PERIMETER LENGTH ,ALP, 25750
      C      FOR REFERENCE PLANE X, 25760
      C      INITIALIZE DATA 25820
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 25840
81      350 IF (NPLANE-KPLANE) 360,290,360 25860
82      360 I=1 25870
83      TAU=0.0 25880
84      IWEB=1
85      NWFH=0
86      RC=RE1
87      NTEST=0 25890
88      370 CALL LPDAPS 25900
89      IF (TAU) 380,380,390 25910
90      380 APORTX = P1*RFDM**2 -AFF
91      TMAX=TAUM 25930
92      IF (TSLVDN.GT.0.0) TMAX=TSLVDN
93      TMAX=AMINI(TMAX,TAUM) 25950
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 25970
      C      STORE GEOMETRY VALUES FOR PLANE X. 25990
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26010
94      390 ALPLX(I)=ALP 26030
95      AKGYPX(I)=AKGY 26040
96      TAUPX(I)=TAU 26050
97      IF (NPLANE=1) 410,410,400 26060
98      400 IF (NPLANE-KPLANE) 510,410,410 26070
99      410 IF (NTABE) 420,420,510 26080
100     420 IF (NPLANE=1) 440,430,440 26090
101     430 IF (BTAOE) 440,440,510 26100
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26120
      C      DETERMINE FUEL AREA, ASE, AND VOLUME, SUMDV, 26140
      C      FOR END SECTION. 26150
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26170
102     440 CALL RCSUB 26190
103     CALL ASESUB 26200
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26220
      C      STORE FUEL AREA, ASE, FOR END SECTION. 26240
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26260
      C      ABEND(I)=ASE 26280
104     IF (NEND.EQ.1.OR.NSUBMG.EQ.0) GO TO 445
105     ABNA(I)=ASEA
106     ABNB(I)=ASEB
107     445 TAUEND(I)=TAU
108     IF (TAU) 480,450,480 26300
109     450 IF (NPLANE=1) 470,460,470 26310
110     460 IF (NGEOMD.LE.1) VFH0=SUMDV 26320
111     TAU0=TAU 26330
112     AINCW=0.0 26340
113     GO TO 480 26350
114     470 IF (VFH0.GT.0.0) GO TO 475

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116      VFNO=SUMDV
117      IF(NSUBMG.EQ.0) GO TO 475
118      VFNOA=SUMDVA
119      VFNOB=SUMDVB
120      475 AINCW=HCO
121      480 IF(KMOICG)510,500,510
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26420
      C      DETERMINE MOI AND CG FOR END SECTION AND STORE 26440
      C      PARAMETERS. 26450
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26470
122      500 CALL PTIAA(1)
123      XCGE(1)=XBARI 26500
124      PMOIE(1)=AJPP 26510
125      RMOIE(1)=AJBB 26520
126      IF(NEND.EQ.1,OR, NSUBMG.EQ.0) GO TO 510
127      XCGNA(1)=XBARIA
128      XBARI8=XBARI8+HSUBMG
129      IF(XBARI8.EQ,HSUBMG) XBARI8=0.0
130      XCGNB(1)=XBARI8
131      PMOINA(1)=AJPPA
132      PMOINB(1)=AJPPB
133      RMOINA(1)=AJBBA
134      RMOINB(1)=AJBBB
135      510 IF(50-1)520,540,540 26530
136      520 WRITE(6,530) NPLANE,DTAUX,DTAUWX
137      530 FORMAT(27H0INVALID DTAU=DTAUW. PLANE ,A1,38H TABLES EXCEED THE MA 26550
      XX. ALLOWED (50). / 10X,36HCHANGE ONE OF THESE VALUES DTAU = 26560
      X F7.4,5X,BHDTAUW = F7.4 ) 26570
138      ICHN=5 26580
139      RETURN 26590
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26610
      C      INCREMENT TAU 26630
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26650
140      540 GO TO (541,544,545,547),IWEB
141      541 IF((TAU+DTAUX).LT,TAUWDM) GO TO 542
142      DLTWTM=TMAX-TAUWDM
143      IF(DLTWTM.LT.(.0001)) GO TO 543
144      TAU=TAUWDM
145      IWEB=2
146      GO TO 570
147      542 TAU=TAU+DTAUX
148      GO TO 570
149      543 TAU=TMAX+.01
150      IWEB=4
151      GO TO 570
152      544 TAU=TAUWDM+.01
153      IWEB=3
154      GO TO 570
155      545 IF((TAU+DTAUWX).LT,TMAX) GO TO 546
156      TAU=TMAX+.01
157      IWEB=4
158      GO TO 570
159      546 TAU=TAU+DTAUWX
160      GO TO 570
161      547 I=I+1

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162      TAUPLEX(I)=TMAX
163      ALPPLX(I)=0.0
164      AKGYPX(I)=0.0
165      IF((NPLANE.EQ.KPLANE).AND.(NGEOMN.EQ.0)) GO TO 560
166      GO TO 660
167      560 TAUEND(I)=TMAX
168      ABEND(I)=0.0
169      ABNA(I)=0.0
170      ABNB(I)=0.0
171      IF(KMOICG.EQ.1) GO TO 660
172      XCGE(I)=0.0
173      XCGNA(I)=0.0
174      XCGNB(I)=0.0
175      PMOIE(I)=0.0
176      PMOINA(I)=0.0
177      PMOINB(I)=0.0
178      RMOIE(I)=0.0
179      RMOINA(I)=0.0
180      RMOINB(I)=0.0
181      GO TO 660
182      570 IF(NEND.NE.2) GO TO 575
183      IF(NSUBMG.EQ.0) GO TO 575
184      IF(NWEB.LT.2) GO TO 571
185      GO TO 575
186      571 IF(NWEB.EQ.1) GO TO 573
187      IF(TAU.GE.TAUMNB) GO TO 572
188      GO TO 575
189      572 TAU=TAUMNB-0.01
190      NWEB=1
191      IWEB=3
192      GO TO 575
193      573 TAU=TAUMNB
194      NWEB=2
195      IWEB=3
196      575 IF(NTEST.GT.2) GO TO 620
197      IF(NTEST.GT.0) GO TO 590
198      IF(TMAX-TAU) 580,580,630
199      580 NTEST=1
200      GO TO 670
201      590 IF(NTEST.GT.1) GO TO 600
202      NTEST=2
203      GO TO 670
204      600 IF((ISLVDM+1.0E-06).GT.TAUM .OR. ISLVDM.LT.TAUMDM) GO TO 610
205      ALPSLV(NPLANE)=ALP
206      SLVA(NPLANE)=AFP*ANODM
207      ASLVR=SLVA(NPLANE)
208      GO TO 620
209      610 ALPSLV(NPLANE)=0.0
210      SLVA(NPLANE)=0.0
211      ASLVR=0.0
212      620 ALPPLX(I)=0.0
213      AKGYPX(I)=0.0
214      ALP=0.0
215      NTEST=3
216      630 IF(ALP) 640,640,670

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26720

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26900

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217 640 IF (NTABE) 660, 650, 660 26940
218 650 IF (ASE) 660, 660, 670 26950
219 660 NGEUMX=I 26960
220 NGEUEN=I 26970
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 26990
      C PLANE X GEOMETRY CALCULATIONS HAVE BEEN 27010
      C COMPLETED FOR THIS FRAME. RETURN TO 2030. 27020
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 27040
221 GO TO 20 27070
222 670 I=I+1 27080
223 GO TO 370
224 675 NTABE = -1
225 IF (NGEDMN.GT.0) GO TO 685
226 DO 680 J=1,50
227 TAUN(J)= TAUEND(J)
228 ABN(J) = ABEVD(J)
229 PMOIN(J)= PMOIE(J)
230 RMOIN(J)= RMOIE(J)
231 680 XCGN(J)=XCGE(J)
232 NGEOMN = NGEUEN
233 685 IF (NGEOMN.GT.0) GO TO 690
234 ICHN=3
235 GO TO 700
236 690 ICHN=4
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 27110
      C COMPUTE REFERENCE PLANE INERT SLIVER AREA, PERIMETER, AND VOLUME. 27130
      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 27150
237 700 VSLVR=0.0
238 IF (ISLVR(1).LE.0.0) RETURN
239 DO 720 I=2,KPLANE
      C 27220
      C THSLV=ACOS((RF**2+R07**2-(R5+TSLVR)**2)/(2*RF*R07)) 27230
      C 27240
240 VSLVR = VSLVR + (SLVA(I)+SLVA(I-1))*(AINCIN(I)-AINCIN(I-1))/2.0
241 720 CONTINUE
242 WRITE(6,730) VSLVR, (I,SLVA(I),ALPSLV(I),I=1,NPLANE)
243 730 FORMAT(1H0,27HTOTAL INERT SLIVER VOLUME =1PE16.9//1X,55HINERT SLIV 27350
      XER AREA AND PERIMETER AT EACH REFERENCE PLANE//10X,15HREFERENCE PL 27360
      XANE,6X,11HSLIVER AREA,6X,16HSLIVER PERIMETER/(18X,16.7X, E11.5,8X 27370
      3,E11.5))
244 WRITE(6,740) 27390
245 740 FORMAT(1H1//) 27400
246 RETURN 27410
247 END

```

SYMBOL	-----	REFERENCES	-----
10	- 4600	48*	
15	- 4900	50*	
20	- 56*	221	
30	- 5600	59*	
40	- 6500	70*	
290	- 73*	81	
350	- 55	81*	
360	- 80	81	82*
370	- 88*	223	
380	- 89	90*	
390	- 89	94*	
400	- 97	98*	
410	- 97	98	99*
420	- 99	100*	
430	- 100	101*	
440	- 100	101	102*
445	- 105	108*	
450	- 109	110*	
460	- 110	111*	
470	- 110	115*	
475	- 115	117	120*
480	- 109	114	121*
500	- 121	122*	
510	- 98	99	101 121 126 135*
520	- 135	136*	
530	- 136WR	137*	
540	- 135	140*	
541	- 140	141*	
542	- 141	147*	
543	- 143	149*	
544	- 140	152*	
545	- 140	155*	
546	- 155	159*	
547	- 140	161*	
560	- 165	167*	
570	- 146	148	151 154 158 160 182*
571	- 184	186*	
572	- 187	189*	
573	- 186	193*	
575	- 182	183	185 188 192 196*
580	- 198	199*	
590	- 197	201*	
600	- 201	204*	
610	- 204	209*	
620	- 196	208	212*
630	- 198	216*	
640	- 216	217*	
650	- 217	218*	
660	- 166	171	181 217 218 219*
670	- 200	203	216 218 222*
675	- 4500	62	63 64 72 224*
680	- 22600	231*	
685	- 225	233*	

I N D E X

SUBROUTINE MNCHN2

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690	=	233	236*			
700	=	235	237*			
720	=	239D0	241*			
730	=	242WR	243*			
740	=	244WR	245*			
A	=	15C0	50=			
ABEND	=	37DI	67	104=	168=	228
ABHD	=	6C0	67=			
ABN	=	6C0	228=			
ABNA	=	35C0	106=	169=		
ABNB	=	35C0	107=	170=		
ACG	=	19C0				
ACK	=	20C0				
AFF	=	26C0	90			
AFP	=	28C0	206			
AHH	=	21C0				
AHO	=	25C0				
AINC	=	16C0	48=			
AINCIN	=	3C0	48	240		
AINCW	=	31C0	113=	120=		
AJBH	=	30C0	125			
AJBBA	=	36C0	133			
AJBHB	=	36C0	134			
AJBH	=	30C0				
AJBHED	=	21C0				
AJBHN	=	21C0				
AJBHO	=	22C0				
AJBN	=	30C0				
AJBNOZ	=	21C0				
AJPHED	=	21C0				
AJPHN	=	21C0				
AJPHO	=	22C0				
AJPNOZ	=	21C0				
AJPP	=	26C0	124			
AJPPA	=	36C0	131			
AJPPB	=	36C0	132			
AJSTB	=	23C0				
AJSTP	=	23C0				
AK	=	9C0				
AKGY	=	31C0	95			
AKGYP	=	6C0	59=			
AKGYPX	=	37DI	59	95=	164=	213=
AKK	=	9C0				
AKRST	=	31C0				
AL	=	26C0				
ALA	=	3C0				
ALADM	=	16C0				
ALB	=	3C0				
ALBDM	=	16C0				
ALC	=	15C0				
ALO	=	15C0				
ALE	=	3C0				
ALBDM	=	16C0				
ALFE	=	18C0				
ALFEM	=	18C0				

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ALL	-	26C0				
ALP	-	32C0	94	205	214=	216
ALPPL	-	6C0	58=			
ALPPLX	-	3701	58	94=	163=	212=
ALPSLV	-	3701	205=	209=	242WR	
ALPX	-	25C0				
ALPY	-	25C0				
ALO	-	22C0				
ALS1	-	3C0				
ALS1DM	-	16C0				
ALS2	-	3C0				
ALS2DM	-	16C0				
AL7	-	28C0				
ALB	-	28C0				
AMIN1	-	93				
AMPN	-	31C0				
AMT1	-	22C0				
AMTJ	-	22C0				
AMW	-	31C0				
ANK	-	19C0				
ANU	-	3C0				
ANODM	-	16C0	206			
AOEM	-	17C0	40=	75=		
AOHM	-	7C0	40			
AONM	-	8C0	75			
A01	-	3C0				
A02	-	3C0				
A03	-	3C0				
A04	-	3C0				
A05	-	3C0				
AP	-	29C0				
APORT	-	6C0	61=			
THE VARIABLE~ APORTX -IS USED BEFORE IT IS DEFINED						
APOTX	-	61	90=			
APX	-	25C0				
APY	-	25C0				
ASE	-	26C0	104	218		
ASEA	-	34C0	106			
ASEB	-	34C0	107			
ASESUB	-	103*				
ASI	-	26C0				
ASLVR	-	25C0	207=	211=		
AT	-	31C0				
AW	-	16C0				
BE	-	17C0	39=	74=		
BH	-	7C0	39			
BHOLD	-	23C0				
BN	-	8C0	74			
BRNOUT	-	29C0				
BTAOE	-	7C0	43	64	101	
BVX	-	28C0				
BVXX	-	28C0				
B71M	-	15C0				
B72M	-	15C0				
B91M	-	15C0				

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* INPUTB - 8*
* INPUTC - 9*
* INPUTO - 10*
* INPUTS - 11*
* INPUTU - 12*
* INPUTV - 13*
* INPUTW - 14*
* INPUT1 - 3*
* INPUT2 - 4*
* INPUT3 - 5*
* INPUT4 - 6*
IS1 - 29C0
IS2 - 29C0
IWEB - 84= 140 145= 150= 153= 157= 191= 195=
J - 47= 48 5600 57 58 59 6500 66 67 68 69 70 22600
  227 228 229 230 231
KDUMP - 12C0
KGAM - 32C0
KMOICG - 10C0 121 171
KPLANE - 10C0 4500 81 98 165 23900
KRASBB - 32C0
KRASUB - 30C0
KXRSBB - 32C0
KXRSUB - 30C0
* LPDAPS - 88*
* MNCHN2 - 1*
NEND - 34C0 42= 76= 105 126 182
NGEO - 6C0 60=
  THE VARIABLE= NGE0EN -IS USED BEFORE IT IS DEFINED
NGEOEN - 71 79= 220= 232
NGEOHD - 6C0 41 63 71= 111 233
NGEOMN - 6C0 78 165 225 232=
NGEOHX - 5600 60 79 219=
NI - 29C0
NINCPL - 29C0
NPLANE - 4500 47 50 51 52 53 54 57 58 59 60 61 62
  81 97 98 100 110 136WR 165 205 206 207 209 210 242WR
NSLOT - 29C0
NSUBMG - 34C0 105 117 126 183
NTABE - 29C0 41= 43= 78= 99 217 224=
NTEST - 87= 196 197 199= 201 202= 215=
NTME - 29C0
NWEB - 85= 184 186 190= 194=
P - 31C0
PA - 12C0
* PARMA - 28*
* PARMAB - 34*
* PARMAD - 35*
* PARMAE - 36*
* PARMB - 29*
* PARMD - 30*
* PARMF - 31*
* PARMO - 32*
* PARMS - 33*
PH - 31C0

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PHI	-	12C0			
PI	-	2C0	90		
PI02	-	2C0			
PMAK	-	29C0			
PMIN	-	29C0			
PMOIE	-	37DI	68	124=	175= 229
PMOIH0	-	6C0	68=		
PMOIN	-	6C0	229=		
PMOINA	-	35C0	131=	176=	
PMOINB	-	35C0	132=	177=	
PON	-	31C0			
* PT1AA	-	122*			
RA	-	26C0			
RADIAN	-	2C0			
RAD	-	26C0			
RBH1	-	25C0			
RC	-	26C0	86=		
* RCSUB	-	102*			
* RETURN	-	139*	238*	246*	
RE1	-	18C0	44AG	77AG	86
RE2	-	18C0			
RF	-	3C0			
RFDM	-	16C0	90		
RFH1	-	25C0			
RGF	-	23C0			
RGFB	-	23C0			
RGI	-	23C0			
RGI0	-	23C0			
RHOLD	-	23C0			
RH1	-	19C0	44AG		
RIG	-	7C0			
RMOIE	-	37DI	69	125=	178= 230
RMOIH0	-	6C0	69=		
RMOIN	-	6C0	230=		
RMOINA	-	35C0	133=	179=	
RMOINB	-	35C0	134=	180=	
RN1	-	20C0	77AG		
R011	-	15C0			
R03	-	15C0			
R05	-	15C0			
R07	-	15C0			
R09	-	15C0			
R1	-	15C0			
R2	-	3C0			
R20M	-	16C0			
R3	-	3C0			
R30M	-	16C0			
R4	-	3C0			
R40M	-	16C0			
R5	-	3C0			
R50M	-	16C0			
R6	-	3C0			
R60M	-	16C0			
R7	-	3C0			
R70M	-	16C0			

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R8	-	3C0												
R8DM	-	18C0												
R9	-	15C0												
SCUR	-	29C0												
SINA	-	27C0												
SLVA	-	37D1	206=	207	210=	240	242WR							
SUMDV	-	26C0	111	116										
SUMOVA	-	34C0	118											
SUMOV8	-	34C0	119											
T	-	31C0												
TAU	-	26C0	83=	89	96	108	109	112	141	144=	147=	149=	152=	155
	-	156=	159=	187	189=	193=	198							
TAUA0	-	21C0	112=											
TAUEND	-	37D1	66	108=	167=	227								
TAUE0	-	18C0												
TAUE1	-	18C0												
TAUHD	-	6C0	66=											
TAUM	-	15C0	91	93	204									
TAUMNA	-	14C0												
TAUMNB	-	14C0	187	189	193									
TAUN	-	6C0	227=											
TAUPL	-	6C0	57=											
TAUPLX	-	37D1	57	96=	162=									
TAUTO	-	29C0												
TAUTOV	-	28C0												
TAUW	-	3C0												
TAUWDM	-	16C0	141	142	144	152	204							
TH0	-	4C0	54											
THSLV	-	25C0												
THSLVV	-	25C0												
TH0X	-	24C0	54=											
TH1	-	15C0												
TH2	-	15C0												
TH3	-	15C0												
TH4	-	15C0												
TIME	-	31C0												
TMAX	-	91=	92=	93=	142	149	155	156	162	167	198			
TOFLAG	-	29C0												
TRAN	-	44*	77*											
TSLVDM	-	25C0	53=		204									
TSLVR	-	4C0	53	238										
T10M	-	15C0												
T12M	-	15C0												
T2M	-	15C0												
T4M	-	15C0												
T5M	-	15C0												
T6M	-	15C0												
T7M	-	15C0												
T9M	-	15C0												
U	-	31C0												
VCE	-	18C0												
VCH	-	19C0												
VCN	-	20C0												
VCNINA	-	13C0												
VCNINB	-	13C0												

VFE0	-	1800			
VFH0	-	1900	111=		
VFNO	-	2000	115	116=	
VFNOA	-	1300	118=		
VFNOB	-	1300	119=		
VSLVR	-	2500	237=	240=	242NR
WDOT	-	2900			
WDOTD	-	2900			
WI	-	2600			
* WORKA	-	16*			
* WORKDE	-	17*			
* WORKHE	-	18*			
* WORKRH	-	19*			
* WORKRN	-	20*			
* WORK45	-	15*			
WT	-	2600			
WTST	-	2300			
XBARI	-	3000	123		
XBARIA	-	3600	127		
XBARI8	-	3600	128=	129	130
XBARIH	-	2600			
XBARS1	-	2300			
XBH	-	2100			
XB1H	-	2200			
XBN	-	2100			
XCGE	-	3701	70	123=	172= 231
XCGHD	-	600	70=		
XCGN	-	600	231=		
XCGNA	-	3500	127=	173=	
XCGNB	-	3500	130=	174=	
XR	-	2600			
X011	-	1500			
X03	-	1500			
X05	-	1500			
X07	-	1500			
X09	-	1500			
X45	-	1500			
X76	-	1500			
Y011	-	1500			
Y03	-	1500			
Y05	-	1500			
Y07	-	1500			
Y09	-	1500			
Y45	-	1500			
Y76	-	1500			

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```

112      IWEB=2
113      GO TO 280
114      242 TAU = TAU+DTAUX
115      GO TO 280
116      243 TAU=TDMAX*.01
117      IWEB=4
118      GO TO 280
119      244 TAU=TAUW*.01
120      IWEB =3
121      GO TO 280
122      245 IF((TAU+DTAUX).LT.TDMAX) GO TO 246
123      TAU=TDMAX*.01
124      IWEB=4
125      GO TO 280
126      246 TAU = TAU + DTAUX
127      GO TO 280
128      247 I=I+1
129      TAUHD(I)=TDMAX
130      A9HD(I)=0.0
131      XCGHD(I)=0.0
132      PMOJHD(I)=0.0
133      RMOJHD(I)=0.0
134      GO TO 290
135      280 I=I+1
136      GO TO 20
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      PLANE A AND HEAD END WEB GEOMETRY CALCULATIONS
C      HAVE BEEN COMPLETED.  STORE GEOMETRY TABLES.
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
137      290 NGEUHD=I
138      ICHN=4
139      300 RETURN
140      END

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29340
29350
29370
29390
29400
29420
29440
29450
29460

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SYMBOL	-----	REFERENCES	-----
10	-	27D0	29*
15	-	30D0	31*
20	-	42*	136
30	-	45	46*
40	-	45	48*
50	-	49	50*
60	-	50	51*
70	-	53	54*
80	-	53	59*
90	-	50	61*
100	-	60	63*
110	-	62	64*
120	-	70	71*
130	-	70	74*
140	-	73	76*
150	-	77	78*
160	-	77	80*
170	-	84	85*
180	-	84	88*
190	-	87	90*
200	-	49	50
210	-	102*	97*
220	-	102	103*
230	-	103WR	104*
240	-	102	107*
241	-	107	108*
242	-	108	114*
243	-	110	116*
244	-	107	119*
245	-	107	122*
246	-	122	126*
247	-	107	128*
280	-	113	115
290	-	134	137*
300	-	139*	
A	-	11C0	31=
AAN	-	24C0	
ABHD	-	6C0	101=
ABN	-	6C0	130=
ABTOT	-	24C0	
ACG	-	15C0	
AFF	-	21C0	
AHH	-	17C0	48=
AHO	-	20C0	47=
AINC	-	12C0	29=
AINCIN	-	3C0	29
AIT	-	24C0	
AJBHED	-	17C0	93=
AJBHEW	-	16C0	92=
AJBHN	-	17C0	56
AJBHO	-	18C0	72=
AJBNOZ	-	17C0	
AJPHED	-	17C0	91=

I N D E X

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AJPHEW	-	16C0	90=	99			
AJPHN	-	17C0	55	66			
AJPHO	-	18C0	71=	74=	90	91	
AJPNOZ	-	17C0					
AJPP	-	21C0					
AJSTB	-	19C0	56	67			
AJSTP	-	19C0	55	66			
AKGYP	-	6C0					
AKRFB	-	16C0	58=	68	69		
AKRFP	-	16C0	57=	60	64	65	70
AKRIH	-	16C0	56=	68	69		
AKRIP	-	16C0	55=	60	64	65	70
AL	-	21C0					
ALA	-	3C0					
ALADM	-	12C0					
ALB	-	3C0					
ALBDM	-	12C0					
ALC	-	11C0					
ALD	-	11C0					
ALDP	-	22C0					
ALE	-	3C0					
ALEDM	-	12C0					
ALFE	-	14C0					
ALFEM	-	14C0					
ALHO	-	22C0					
ALL	-	21C0					
ALPPL	-	6C0					
ALPX	-	20C0					
ALPY	-	20C0					
ALQ	-	18C0					
ALS1	-	3C0					
ALS1DM	-	12C0					
ALS2	-	3C0					
ALS2DM	-	12C0					
AMTI	-	18C0					
AMTJ	-	18C0					
ANK	-	15C0					
ANQ	-	3C0					
ANQDM	-	12C0					
AQEM	-	13C0	34=				
AQHM	-	7C0	34				
AQ1	-	3C0					
AQ2	-	3C0					
AQ3	-	3C0					
AQ4	-	3C0					
AQ5	-	3C0					
APORT	-	6C0					
APX	-	20C0					
APY	-	20C0					
ASE	-	21C0					
ASI	-	21C0	47	48	101		
ASLVR	-	20C0					
ASTSUB	-	52*					
AW	-	12C0					
BE	-	13C0	33=				

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I N D E X

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*	INPUTU	-	10*					
*	INPUT1	-	3*					
*	INPUT2	-	4*					
*	INPUT3	-	5*					
*	INPUT4	-	6*					
	IWEB	-	41=	107	112=	117=	120=	124=
	J	-	28=	29				
	KDUMP	-	10C0					
	KMOICG	-	8C0	49				
	KPLANE	-	8C0					
*	MNCHN3	-	1*					
	NGEO	-	6C0					
	NGEOHD	-	6C0	137=				
	NGEOMN	-	6C0					
	PA	-	10C0					
*	PARMG	-	24*					
*	PARMJ	-	25*					
*	PARMS	-	26*					
	PHI	-	10C0					
	PI	-	2C0					
	PI02	-	2C0					
	PMOIH0	-	6C0	99=	132=			
	PMOIN	-	6C0					
	RA	-	21C0					
	RADIAN	-	2C0					
	RA0	-	21C0					
	RBHI	-	20C0					
	RC	-	21C0					
*	RCSUB	-	42*					
*	RETURN	-	44*	106*	139*			
	RE1	-	14C0	35A6				
	RE2	-	14C0					
	RF	-	3C0					
	RFDM	-	12C0					
	RFHI	-	20C0					
	RGF	-	19C0	57				
	RGFB	-	19C0	58				
	RGI	-	19C0	55				
	RGIB	-	19C0	56				
*	RGISUB	-	54*					
	RHOLD	-	19C0					
	RH1	-	15C0	35A6				
	RIG	-	7C0					
	RMOIH0	-	6C0	100=	133=			
	RMOIN	-	6C0					
	ROPE1	-	22C0					
	ROPE2	-	22C0					
	ROPE3	-	22C0					
	R011	-	11C0					
	R03	-	11C0					
	R05	-	11C0					
	R07	-	11C0					
	R09	-	11C0					
	R1	-	11C0					
	R2	-	3C0					

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I N D E X

SUBROUTINE MNCHN3

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T7M	-	11C0					
T9M	-	11C0					
VCE	-	14C0					
VCH	-	15C0					
VEH	-	24C0					
VFED	-	14C0					
VFH	-	24C0	55	56	59	78	80
VFHO	-	15C0	46=				
VFINT	-	24C0					
VFN	-	24C0					
VIS	-	24C0					
VSLVR	-	20C0					
VSTO	-	22C0					
VSTR	-	22C0					
W1	-	21C0					
* WOKKA	-	12*					
* WOKKOE	-	13*					
* WOKKRE	-	14*					
* WOKKRH	-	15*					
* WOKK45	-	11*					
WT	-	21C0					
WTH	-	25C0	55	56	59	78	81 83
WTS1	-	19C0	55	56	59	78	81 82
XBARIH	-	21C0	78	86=	89=	94	95
XBARRF	-	16C0	79=	84	86	89	
XBARKI	-	16C0	78=	84	86	89	
XBARST	-	19C0	78	82			
XBH	-	17C0	94=				
XBHEW	-	95=	98				
XBIH	-	18C0	78	83			
XBN	-	17C0					
XCSHD	-	6C0	98=	131=			
XCGN	-	6C0					
XMAX	-	22C0					
XR	-	21C0					
X011	-	11C0					
X03	-	11C0					
X05	-	11C0					
X07	-	11C0					
X09	-	11C0					
X45	-	11C0					
X76	-	11C0					
YMAX	-	22C0	79				
Y011	-	11C0					
Y03	-	11C0					
Y05	-	11C0					
Y07	-	11C0					
Y09	-	11C0					
Y45	-	11C0					
Y76	-	11C0					
ZMAX	-	22C0					

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1      XBH,XBN,DTINT
36     COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RBZTO(101),PD(101),
1      TAUWDP(101),RB,VF,DWDOT,VP
37     COMMON/COMH/POPR(101),V(101),VFR(101)
38     COMMON/COMM/TAUTOZ,RSLVRN,AX(45),AY(45),AINCX(1),ANOX,RFY,TAUWX.
1      DUMX(17),AINCX(1),ANOY,RFY,TAUWY,DUMY(17),VFPP
39     COMMON/COMN/TSLVRX,TSLVRY
40     COMMON/COMO/THSLV,TSLVDM,THSLVV,ASLVR,AHO,RFHI,ALPX,APX,
1      RBHI,ALPY,APY,VSLVR
41     COMMON/COMS/TPR,AKRADJ,IEND
42     COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,
1      RAO,ALL,AJPP,AST
43     COMMON/PARMB/AP,PMIN,PMAX,WDOT,11I,11J,WDOTD,NSLOT,NTABE,NTHE,
1      TAUTO,TOFLAG,NINCPL,BRNOUT,1IS,1S1,1S2,NI,SCUR(18,2)
44     COMMON/PARMQ/KRASUB,KXRSUB,AJBB,HEI,AJBN,AJBH,XBARI
45     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,OIS,AMPN,AT,
1      AMW,AKRST
46     COMMON/PARMG/VFH,AAN,VFN,VIS,AIT,SPHOT,SPONDT,VFINT,VEH,ABTOT
47     COMMON/PAHMI/AOMCYL,AIBCYL,AIPCYL,AKGYX,AKGYY,VPH,VPN
48     COMMON/PAHMK/F,EPI,PEPO,CFOL,VFWEB,WU,DEED,CLOPS,CFD,WGTOT,
1      SWDOTN
49     COMMON/PARMQ/RGYP(18),AFRPL(18),ALPRP(18)
50     COMMON/PAHMR/RUSLOT,RSLOTA,RSLOTF,SLTFLG
51     COMMON/PARMS/ICHN
52     COMMON/PAHMA/ABSLT,PO
53     COMMON/PARMAA/10,IFLAG
54     COMMON/PARMAB/HSUBMG,VSUBMG,NEND,ASEA,ASEB,SUMDVA,SUMDV8
55     COMMON/PARMAD/PMOINA(50),PMOINB(50),RMOINA(50),RMOINB(50),
5      XCGNA(50),XCGNB(50),ABNA(50),ABNB(50)
56     COMMON/PARMAI/VFNA,VFNB,VCNA,VCNB
57     COMMON/PARMAJ/AANA,AAVB,AJPNZA,AJPNZB,AJBNZA,AJBNZB,XHNA,XHNB
58     COMMON/PARMAK/PIAT,AENT,U1A,PIA,P1B,AZA,VGA,PMA,PMZ,TMA,VGA7,
5      MDRETA,U1B,A1A,MD1B
59     COMMON/PARMAL/DWDOTA,DWDOTB,DWDTA,DWDTB,P1BT,T1B,M1B
60     COMMON/PARMAN/A1B,A2B
61     DIMENSION APORT(18),RBRPL(18),SVALP(18)
62     EQUIVALENCE (AX(38),TAUMX),(AY(38),TAUMY)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 30330
C      INITIALIZE REFERENCE FRAME A GEOMETRY TABLES. 30350
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 30370
63     DO 10 I=1,18
64     10 APORT(I)=BPORT(I)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 30650
C      INITIALIZE DATA CELLS. 30670
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 30690
65     20 BIGUN=1.0E+36 30710
66     PH=PHI 30720
67     PON=PHI
68     TPR=1.0
69     AKRHLO=0.0
70     PCTABX=1.0
71     IF(STFLAG.GT. 0.0)PH=0.5*PHI
72     IF(STFLAG.GT.0.0) PON=0.5*PHI
73     PO=PH 30730
74     DTINT=0.0 30740

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75      P=PH
76      DWDI=0.0
77      AMO=0.0
78      IF (NCSTR) 25,25,24
79      24 CALL XLIN(PRESS,TCOMB,NCSTR,PH,TO,1)
80      CALL XLIN(PRESS,GAMAG,NCSTR,PH,GAMA,2)
81      25 T=TO
82      UT=SQRT(TO*R*GNOT*GAMA*2./(GAMA+1.0))
83      TIME=0.0
      C
      C      SET DEL-TIME TO EITHER STEADY-STATE OR TRANSCIENT VALUE
      C
84      DELI=DELTS
85      IF (STFLAG.GT. 0.5) DELT=DELTS
86      Y1=0.0
87      TAU=0.0
88      AMO = ABH(1)
89      ANOX= ABN(1)
90      IF (NSUBMG.EQ.0) GO TO 26
91      ANOAX=ABNA(1)
92      ANOBX=ABNB(1)
93      26 AAN=ANOX
94      AMH=AMO
95      VFH=VFHO
96      VFN=VFNO
97      IF (NSUBMG.EQ.0) GO TO 27
98      VFNA=VFNOA
99      VFNB=VFNOB
100     AANA=ANOAX
101     AANH=ANOBX
102     27 IF (VCHINP.GT.0.0) VCH=VCHINP
103     IF (VCNINP.GT.0.0) VCN=VCNINP
104     DO 28 I=1,18
105     28 ALPRP(I)= ALPPL(I,I)
106     IF (STFLAG) 35,35,30
107     30 PH=0.5*PHI
108     35 NIP1 = NI + 1
109     NIP2=NI+2
110     DO 40 I=1,NIP2
111     PDPR(I)=0.5*PHI
112     TAUZ(I)=0.0
113     TAUZTO(I)=0.0
114     TAUWDP(I)=0.0
115     RBZTO(I)=0.0
116     PRNT(I,11)=0.0
117     40 RBZ(I)=0.0
118     DO 41 I=1,18
119     41 TAUPL(I)=0.0
120     50 PMIN=PA
121     PMAX=BIGUN
122     TPR=PON/PH
123     ANLOPS = 0.0
124     IE=0
125     IF (NCH.GT.0) CALL XLIN(TIMECH,TBLCH,NCH,TIME,CH,3)
126     IF (NPA.GT.0) CALL XLIN(TIMEPA,TBLPA,NPA,TIME,PA,30)

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31120

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31140

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CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31160
C   DETERMINE BURN DISTANCE FOR REFERENCE PLANES B THROUGH J. 31180
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31200
127   IF(NAKR.EQ.0) GO TO 60
128   CALL XLIN(TIMAKR,TBLAKR,NAKR,TIME,AKRADJ,4)
129   60   KPM1=KPLANE-1 31220
130       NI=NI-1 31230
131       IIS=1 31240
132       K=1 31250
133   70   DO 320 I=2,KPM1 31260
134       80   IF(SCUR(IIS,1).GE.AINCIN(I)) GO TO 110
135           IF(SCUR(IIS,2).GE.AINCIN(I)) GO TO 110
136   100   IIS=IIS+1 31300
137       GO TO 80 31310
138   110   DO 120 L=K,NI+1 31320
139       IF(AINCIN(I)-ZCALC(L)) 130,130,120
140   120   CONTINUE 31340
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31360
C   ZCALC(K) IS JUST DOWNSTREAM OF AINC 31380
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31400
141   130   CONTINUE 31420
142       IF(SCUR(IIS,1).LE.AINCIN(I)) GO TO 170
143   140   IF(AINCIN(I).GE.ZCALC(L)) GO TO 160
144       M=L
145       L=L-1 31460
146       GO TO 250 31470
147   160   M=L+1 31480
148       GO TO 250 31490
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31510
C   CURRENT REFERENCE IS ON OR DOWNSTREAM OF CURRENT SLOT 31530
C   FORWARD INTERFACE.(I.E. REFERENCE PLANE IS IN THE 31540
C   SLOT). DETERMINE INCREMENT DIVIDING PLANE THAT IS 31550
C   JUST DOWNSTREAM OF SLOT FORWARD INTERFACE. 31560
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31580
149   170   IF(L-1)200,180,180 31600
150   180   IF(SCUR(IIS,1)-ZCALC(L))190,190,200 31610
151   190   L=L-1 31620
152       GO TO 170 31630
153   200   L=L+1 31640
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31660
C   INCREMENT DIVIDING PLANE L IS JUST DOWNSTREAM OF CURRENT 31680
C   SLOT FORWARD INTERFACE. DETERMINE INCREMENT DIVIDING 31690
C   PLANE THAT IS JUST UPSTREAM OF SLOT AFT INTERFACE. 31700
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31720
154       M=L+1 31740
155   210   IF(NI-M)240,220,220 31750
156   220   IF(ZCALC(M)-SCUR(IIS,2))230,230,240 31760
157   230   M=M+1 31770
158       GO TO 210 31780
159   240   M=M-1 31790
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 31810
C   DIVIDING PLANES JUST UPSTREAM (L) AND DOWNSTREAM (M) 31830
C   OF THE CURRENT REFERENCE PLANE (I) HAVE BEEN FOUND. 31840
C   DETERMINE MAXIMUM WEB THICKNESS (TAUM) OF INCREMENT 31850
C   DIVIDING PLANES L AND M. 31860

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31880 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
160 250 TAUMX=GEOCON(38,I-1)
161 TAUMY=GEOCON(38,I)
162 AINCX(1)=AINCIN(I-1)
163 AINCY(1)=AINCIN(I)
164 280 AINCX(1)=AINCY(1)
165 TAUMX=TAUMY
166 AINCY(1)=AINCIN(I+1)
167 TAUMY=GEOCON(38,I+1)
32050 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
32140 C DETERMINE BURN RATE FOR REFERENCE PLANE (I).
32180 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
168 RBRPL(I)=RBZ(L)
169 IF (ZCALC(M).NE.ZCALC(L)) RBRPL(I)=RBZ(L)+(AINCIN(I)-ZCALC(L))*
1 (RBZ(M)-RBZ(L))/(ZCALC(M)-ZCALC(L))
170 320 CONTINUE
171 RBRPL(KPLANE)=RBZ(NI)
172 RBRPL(1)=RBZ(1)
32230 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
32270 C DETERMINE DISTANCE BURNED FOR REFERENCE PLANE (I).
32350 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
173 DO 321 I=1,KPLANE
174 TAURPL(I)=TAURPL(I)+RBRPL(I)*DELT
175 321 TAURPL(I)=AMINI(TAURPL(I),GEOCON(38,I))
32370 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
32390 C SAVE PREVIOUS VALUES OF PERIMETER AND AB(END)
32400 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
176 DO 330 I=1,KPLANE
177 330 SVALP(I)=ALPRP(I)
178 AHO=AHH
179 ANOX=AAN
180 IF (NSUBMG,EU,0) GO TO 340
181 ANOAX=AANA
182 ANOAX=AANB
183 340 TAURPL(1)=TAUZ(1)
32430 C
184 CALL LOOKUP
32450 C
32470 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
32510 C DETERMINE HEAD END GEOMETRY VALUES.
32550 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
185 VFHPR=VFH
32560 VFH=VFHPR-(AHO+AHH)*HBZ(1)*DELT/2.
32570 VFH=AMAX1(VFH,0.0)
32800 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
32600 C DETERMINE REFERENCE PLANE GEOMETRY VALUES.
32600 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
188 DO 520 IPLANE=1,KPLANE
189 APORT(IPLANE)=APORT(IPLANE)+(ALPRP(IPLANE)+SVALP(IPLANE))*
1 RBRPL(IPLANE)*DELT/2.0
190 AFRPL(IPLANE)=(2.0*PI*RF(IPLANE))-APORT(IPLANE)
191 520 CONTINUE
192 APORTN=APORT(KPLANE)
33750 CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
33770 C DETERMINE NOZZLE END GEOMETRY VALUES.

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235      IJJ=1                                34520
236      IIS=1                                34530
237      IF (IE.GT.1) GO TO 1100              34540
238      ANLOPS=ANLOPS+1,                      34550
239      IF (ANLOPS.LT.21.) GO TO 730          34560
240      IE=2                                  34570
241      GO TO 1100                            34580
242 730    VF=VFH                              34590
243      AP=APOINT(1)
244      APH=AP
245      PD(1)=PH
246      P=PH                                34620
247      IF (NCSTR) 750,750,740               34630
248 740    CALL XLIN(PRESS,CSTR,NCSTR,PON,CSTAR,5) 34640
249      CALL XLIN(PRESS,TCOMB,NCSTR,PH,TO,6)
250      CALL XLIN(PRESS,GAMAG,NCSTR,PH,GAMA,7)
251      CALL XLIN(PRESS,AMWG,NCSTR,PH,AMW,8)
252      R=1545.864/AMW
253      IF (CSCOE(1).NE.0.0) CSTAR=CSCOE(1)+CSCOE(2)*
254 750    5 PON+ CSCOE(3)*PON**2              34670
255      I=10                                  34680
256      DELTA=P/(12.*R*T)
257 760    IF (TAUW(1)-TAUTO-TAUZ(1)) 760,760,770
258 770    TOFLAG=1.0                          34700
259      CALL RHSUB
260      IEND=0
261      IF (ICHN.EQ.5) GO TO 550
262      IF (STDYST=1.0) 800,780,780
263 780    IF (AKRH) 800,800,790
264 790    RB=AKRH*P**AKR(37)
265 800    TOFLAG=0.0                          34720
266      RBZ(1)=RB                            34730
267      VPH=VCH-VFH                          34740
268      DWDOT=RB*DELF*AHH                    34750
269      IF (TIME .LT. DELT .AND. STFLAG .GT. 0.0) DWDOT=0.0
270      IF (TIME .LT. DELT .AND. STFLAG .GT. 0.0) DWDOT=0.0
271      IF (PCTAB) 820,820,810                34800
272 810    DWDOT=DWDOT*PCTAB                  34810
273 820    IF (STFLAG) 830,830,840            34820
274 830    CALL ATBSUB(IE)                    34830
275      IF (ICHN.EQ.5) GO TO 550              34840
276      GO TO 850                            34850
277 840    DWDOT=DELTA*(VFHPR-VFH)*ZERODV(DELT)+VPH*(PD(1)-PDPR(1))*
278      XZERODV(12.*R*T*DELT)                34860
279      IF (TIME .LT. DELT) DWDOT=0.0         34870
280      WDOTD=DWDOT-DWDOT
281      WDOTD=AMAX1(0.0,WDOTD)                34880
282      WDOT=WDOTD                            34890
283      P=PD(1)                              34900
284      IE=0                                  34910
285 850    PO=PH                              34920
286      DO 860 I=1,10                        34930
287      U=WDOT*R*T*ZERODV(P*AP)              34940
288      AMACH=U*ZERODV(SQRT (GNOT*R*T*GAMA)) 34950
289

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340      IF(ICHN.EQ.5) GO TO 550                      37330
341      IF(STDYST-1.0) 1030,1010,1010                37340
342      1010 IF(AKRN) 1030,1030,1020                  37350
343      1020 RB=AKRN*P**AKR(37)                        37360
344      1030 TOFLAG=0.0                                37370
345      RBZ(NI+1)=RB                                    37380
346      RBZTO(NI+1)=RB                                37390
347      DWDOT=AA*DELTA*RB                              37400
348      IF(PCTAB) 1050,1050,1040                      37410
349      1040 DWDOT=DWDOT*PCTAB                        37420
350      IF(TIME .LT. DELT .AND. STFLAG .GT. 0.0) DWDOT=0.0
351      1050 III=III+1                                  37430
352      IF(NSUBMG.LL.0) GO TO 1055
353      IOPT=3
354      IF(STDYST.EQ.1.0 .AND. STFLAG.EQ.0.0) IOPT=2
355      CALL NSCE(IOPT)
356      IE=0
357      IF(ICHN.EQ.5) GO TO 550
C      REGION OUTPUT DATA
358      PRINT(III+1,1)=PIBT
359      PRINT(III+1,2)=PIB
360      PRINT(III+1,3)=TIB
361      PRINT(III+1,4)=UIB
362      PRINT(III+1,5)=MIB
363      PRINT(III+1,7)=AIB
364      PRINT(III+1,9)=DWDOTB-DWDOT
365      PRINT(III+1,10)=DWDOTB
366      PRINT(III+1,11)=DWDOT
367      PRINT(III+1,12)=RBZ(NI+2)
368      PRINT(III+1,13)=TAUZ(NI+2)
369      PRINT(III+1,14)=RBZTO(NI+2)
370      PRINT(III,11)=DWDTA
371      III=III-1
372      GO TO 1060
373      1055 CALL AIRST(IE)
374      IF(ICHN.EQ.5) GO TO 550
375      P=PD(III)
376      III=III-1
377      1060 PD=P*(TO/T)**(GAMA/(GAMA-1.))
378      PON=PD
379      VPN=VCN-VPN
380      PRINT(III+1,1)=PON
381      PRINT(III+1,2)=P
382      PRINT(III+1,3)=T
383      PRINT(III+1,4)=U
384      PRINT(III+1,5)=AMACH
385      PRINT(III+1,7)=AP
386      PRINT(III+1,9)=DWDOT
387      PRINT(III+1,10)=DWDOT
388      PRINT(III+1,12)=RB
389      PRINT(III+1,13)=TAUZ(III+1)
390      PRINT(III+1,14)=RBZTO(III+1)
391      IF(NCSTR) 1080,1080,1070
392      1070 TOTEMP=TO
393      CALL XLIN(PRESS,CSTR,NCSTR,PON,CSTAR,9)

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394      CALL XLIN(PRESS,TCOMB,NCSTR,PH,TO,10)
395      CALL XLIN(PRESS,GAMAG,NCSTR,PH,GAMA,11)
396      CALL XLIN(PRESS,AMWG,NCSTR,PH,AMW,12)
397      R=1545.864/AMW
398      IF(
          CSCDEF(1),NE,0.0) CSTAR=CSCDEF(1)*CSCDEF(2)*
          $ PON+ CSCDEF(3)*PON**2
399      TO=TOTEMP
400      1080 IF(IE)580,1090,580
401      1090 CALL SETPH(IE)
402      IF(ICHN.EQ.5)GO TO 550
403      IF(IE)1100,1100,580
404      1100 IF(TIME=DELT)1270,1270,1110
405      1110 IF(BRNDUT-1.1)1120,1270,1270
406      1120 PRCRIT=(2./(GAMA+1.))*GAMA/(GAMA-1.)
407      IF(NAKRST)1270,1270,1260
408      1260 TAU0=TAUZ(NINCPL)
409      TAU0 = AMIN1(TAU0,TAUAKR(NAKRST))
410      IF(NTAU0.GT.0) TAU0=0.0
          C      START AKRST PROJECTION ROUTINE FOR RECONSTRUCTION
411      1270 IF(NRECON.LT.1)DR, TIME,LT.(0.5*TIMAX)) GO TO 1278
          C      INITIALIZE FIRST 4 POINTS INTO TABLE
412      ICOUNT = ICOUNT + 1
413      IF(ICOUNT.GT.4) GO TO 1272
414      AFITC(ICOUNT)=AKRST
415      TAUSAV(ICOUNT)=TAUZ(1)
416      GO TO 1278
417      1272 IF(AFIT.NE.0.0) GO TO 1278
          C      CURVE FIT AND PROJECT THE DATA
418      CALL LESSQ(TAUSAV,AFITC,4,CAFIT)
419      APROJ = CAFIT(1)+CAFIT(2)*TAUZ(1)+CAFIT(3)*TAUZ(1)**2
420      ADEL = (AKRST-APROJ)/AKRST
421      CALL VAR((AKRST,A3SIG,AFITC,4)
422      IF(A3SIG.GT.ABS(ADEL)) GO TO 1274
423      IF(ADEL.LT.0.0) AFIT=-1.0
424      IF(ADEL.GT.0.0) AFIT= 1.0
425      WRITE(6,1273) TIME,AFIT,TAUZ(1),AKRST
426      1273 FORMAT('TIME RECONSTRUCTION HAS DIVERGED// TIME=',F10.6/' AFIT=',
          $F10.6/' TAU(1)=',F10.6/' AKRST=',F10.6,1H1)
427      IF(AFIT.NE.0.0) GO TO 1278
          C      UPDATE TABLES FOR NEXT PASS
428      DO 1276 I=2,4
429      AFITC(I-1)=AFITC(I)
430      TAUSAV(I-1)=TAUSAV(I)
431      1276 CONTINUE
432      AFITC(4)=AKRST
433      TAUSAV(4)=TAUZ(1)
434      1278 CALL IBMOUT(IE)
435      IF(NAKRST)1290,1290,1280
436      1280 CALL RBSTB
437      1290 CONTINUE
438      IF(IE.GT.1) ICHN=5
439      IF(ICHN.EQ.5)GO TO 550
440      IF(TIMAX)1310,1310,1300
          C      CHECK FOR CASE TERMINATION BY MAX. TIME OR MIN. HEAD-END PRESS.
441      1300 CONTINUE

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37690
37700
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38010
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38120
38130

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SYMBOL	-----	REFERENCES	-----
10	- 6300 64*		
20	- 65*		
24	- 78 79*		
25	- 78 81*		
26	- 90 93*		
27	- 97 102*		
28	- 10400 105*		
30	- 106 107*		
35	- 106 108*		
40	- 11000 117*		
41	- 11800 119*		
50	- 120* 458 460 463 464 465 466		
60	- 127 129*		
70	- 133*		
80	- 134* 137		
100	- 136*		
110	- 134 135 138*		
120	- 13800 139 140*		
130	- 139 141*		
140	- 143*		
160	- 143 147*		
170	- 142 149* 152		
180	- 149 150*		
190	- 150 151*		
200	- 149 150 153*		
210	- 155* 158		
220	- 155 156*		
230	- 156 157*		
240	- 155 156 159*		
250	- 146 148 160*		
280	- 164*		
320	- 13300 170*		
321	- 17300 175*		
330	- 17600 177*		
340	- 180 183*		
520	- 18800 191*		
530	- 193 197*		
540	- 196 202*		
545	- 204 206*		
550	- 205 208* 261 275 329 340 357 374 402 439 456		
560	- 208WR 209*		
570	- 210WR 211*		
580	- 202 203 207 212* 310 330 400 403		
680	- 213 214*		
690	- 214 215*		
700	- 214 218*		
710	- 218 219*		
720	- 213 218 222*		
730	- 239 242*		
740	- 247 248*		
750	- 247 254*		
760	- 256 257*		
770	- 256 258*		

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780	-	262	263*		
790	-	263	264*		
800	-	262	263	265*	
810	-	271	272*		
820	-	271	273*		
830	-	273	274*		
840	-	273	277*		
850	-	276	284*		
860	-	28500	292	293*	
870	-	292	294*		
875	-	310	311*		
880	-	31300	316*		
885	-	31700	319*		
950	-	31200	330	331*	
980	-	330	332*		
990	-	336	337*		
1000	-	335	338*		
1010	-	341	342*		
1020	-	342	343*		
1030	-	341	342	344*	
1040	-	348	349*		
1050	-	348	351*		
1055	-	352	373*		
1060	-	372	377*		
1070	-	391	392*		
1080	-	391	400*		
1090	-	400	401*		
1100	-	237	241	403	404*
1110	-	404	405*		
1120	-	405	406*		
1260	-	407	408*		
1270	-	404	405	407	411*
1272	-	413	417*		
1273	-	425WR	426*		
1274	-	422	428*		
1276	-	42800	431*		
1278	-	411	416	417	427 434*
1280	-	435	436*		
1290	-	435	437*		
1300	-	440	441*		
1310	-	440	442	443*	
1320	-	444	445*		
1330	-	444	445	446*	
1340	-	447	448*		
1350	-	44900	451*		
1360	-	447	452*		
1370	-	453	455*		
1380	-	454	457*		
1390	-	459*			
1400	-	460	461*		
1410	-	461	462*		
1420	-	461	463*		
1430	-	463	464*		
1440	-	464	465*		
1450	-	465	466*		

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PAGE 258

APX	-	40C0	320=																	
APY	-	40C0	323=																	
ASE	-	42C0																		
ASEA	-	54C0																		
ASEB	-	54C0																		
ASI	-	42C0																		
ASLVR	-	40C0																		
AT	-	45C0																		
AW	-	24C0																		
AX	-	38C0	62EQ	318=																
AY	-	38C0	62EQ	319=																
A1A	-	58C0																		
A1B	-	60C0	363																	
A2A	-	58C0																		
A2B	-	60C0																		
A3SIG	-	421AG	422																	
BIGUN	-	65=	121																	
* BLK005	-	5*																		
* BLK021	-	6*																		
* BLK024	-	7*																		
B0	-	27C0																		
BPORT	-	12C0	64																	
BRNDUT	-	43C0	210WR	405	444	464														
BTA0	-	27C0																		
CAFIT	-	40I	418AG	419																
CFO	-	48C0																		
CFOL	-	48C0																		
CKDUMP	-	19C0	203	204	214	218														
CKTIME	-	31C0	210WR																	
CLOPS	-	48C0	210WR																	
CM	-	18C0	125AG																	
CO	-	27C0																		
* COMA	-	34*																		
* COMB	-	35*																		
* COMG	-	36*																		
* COMH	-	37*																		
* COMM	-	38*																		
* COMN	-	39*																		
* COMO	-	40*																		
* COMS	-	41*																		
* COMT	-	42*																		
* CONSTS	-	8*																		
COSGM1	-	27C0																		
COSGM2	-	27C0																		
COSTHR	-	27C0																		
CSBAR	-	6C0																		
CSCDEF	-	6C0	253	398																
CSTAR	-	16C0	248AG	253=	393AG	398=														
CSTR	-	16C0	248AG	393AG																
DE	-	18C0																		
DEED	-	48C0																		
DELF	-	22C0	268	347																
DELT	-	34C0	84=	85=	174	186	189	194	197	198	269	270	277	278						
DELTA	-	350	404	461																
	-	45C0	255=	277																

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	NIP2	-	109=	11000															
	NLEWIS	-	500																
	NPA	-	1900	126															
	NPH	-	1500	453	458														
*	NRECON	-	500	411	453	458													
	NSCE	-	355*																
	NSI	-	500																
	NSLOT	-	4300	210WH															
	NSUBMG	-	5400	90	97	180	193	352											
	NTABE	-	4300																
	NTAUTO	-	1500	410															
	NTLS14	-	3100																
	NTME	-	4300	210WH															
	P	-	4500	75=	246=	255	264	282=	28b	289=	290	294	297	343	375=				
		-	377	381															
	PA	-	2200	120	126AG	445	456												
*	PARMAA	-	53*																
*	PARMAH	-	54*																
*	PARMAD	-	55*																
*	PARMAI	-	56*																
*	PARMAJ	-	57*																
*	PARMAK	-	58*																
*	PARMAL	-	59*																
*	PARMAN	-	60*																
*	PARMB	-	43*																
*	PARMD	-	44*																
*	PARME	-	45*																
*	PARMG	-	46*																
*	PARMI	-	47*																
*	PARMK	-	48*																
*	PARMQ	-	49*																
*	PARMR	-	50*																
*	PARMS	-	51*																
*	PARMZ	-	52*																
	PCTAB	-	1500	271	272	348	349												
	PCTABX	-	2800	70=															
	PD	-	3600	245=	277	282	294=	375	451										
	PDPH	-	3700	111=	277	451=													
	PEPU	-	4800																
	PH	-	4500	66=	71=	73	75	79AG	80AG	107=	122	245	246	249AG	250AG				
		-	251AG	284	295	394AG	395AG	396AG	445	462=									
	PHI	-	2200	66	67	71	72	107	111	462									
	PHST	-	1500																
	PI	-	800	190															
	PIO2	-	800																
	PITw	-	600																
	PMA	-	5800																
	PMAX	-	4300	121=															
	PMAL	-	5800																
	PMIN	-	4300	120=															
	PMOHD	-	1200																
	PMOIN	-	1200																
	PMOINA	-	5500																
	PMOINB	-	5500																
	PNSBAR	-	600																

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PO	-	52C0	73=	284=	289	295=	296	377=	378								
PON	-	45C0	67=	72=	122	248AG	253	378=	380	393AG	398	466					
PRCNIT	-	29C0	406=	445													
PRESS	-	16C0	79AG	80AG	248AG	249AG	250AG	251AG	393AG	394AG	395AG	396AG					
PRNT	-	34C0	116=	296=	297=	298=	299=	300=	301=	302=	303=	304=	305=	306=			
		307=	308=	309=	358=	359=	360=	361=	362=	363=	364=	365=	366=	367=			
		368=	369=	370=	380=	381=	382=	383=	384=	385=	386=	387=	388=	389=			
		390=															
PIA	-	58C0															
PIAT	-	58C0															
PIB	-	58C0	359														
PIBI	-	59C0	358														
K	-	16C0	82	252=	255	277	286	287	290	397=							
RA	-	42C0															
RADIAN	-	8C0															
RAO	-	42C0															
RB	-	36C0	233=	264=	266	268	306	343=	345	346	347	388					
RBFLAG	-	13C0															
RBHI	-	40C0															
RBKPL	-	610I	168=	169=	171=	172=	174	189									
RB SLOT	-	50C0															
* RBSTSB	-	435*	455*														
* RB SUB	-	259*	339*														
RBZ	-	36C0	117=	168	169	171	172	186	194	197	198	233	266=	345=			
		367															
RBZTO	-	36C0	115=	308	346=	369	390										
RC	-	42C0															
* RETURN	-	212*	464*														
RF	-	9C0	190														
RFU4	-	24C0															
RFHI	-	40C0															
RF X	-	38C0															
RF Y	-	38C0															
RGYP	-	49C0	321	324													
RHI	-	25C0															
RMOIH0	-	12C0															
RMOIN	-	12C0															
RMOINA	-	55C0															
RMOINB	-	55C0															
RNI	-	26C0															
RSLUTA	-	50C0															
RSLUTF	-	50C0															
RSLVRN	-	38C0															
R2	-	9C0															
R2DM	-	24C0															
R3	-	9C0															
R3DM	-	24C0															
R4	-	9C0															
R4DM	-	24C0															
R5	-	9C0															
R5DM	-	24C0															
R6	-	9C0															
R6DM	-	24C0															
R7	-	9C0															
R7DM	-	24C0															

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	RB	-	9C0																
	RBDM	-	24C0																
	SCUR	-	43C0	134	135	142	150	156											
*	SEGSUB	-	328*																
*	SETPH	-	401*																
	SINGM1	-	27C0																
	SINGM2	-	27C0																
	SINTHR	-	27C0																
	SLTFLG	-	50C0	210WR															
	SPHDT	-	46C0																
	SPDNDT	-	46C0																
*	SORT	-	82	287															
	STATIC	-	3LG	6C0															
	STOYST	-	20C0	262	341	354													
	STFLAG	-	20C0	71	72	85	106	269	270	273	350	354	447	460					
	SUMDV	-	42C0																
	SUMDVA	-	54C0																
	SUMDVH	-	54C0																
	SVALP	-	61D1	177=	189														
	SXDOTN	-	48C0																
	T	-	45C0	81=	254=	255	277	286	287	298=	289	290	298	377	182				
	TANGM2	-	27C0																
	TANPH1	-	27C0																
	TAU	-	42C0	87=	232=														
	TAUAKH	-	15C0	409															
	TAUAD	-	35C0																
	TAUHD	-	12C0																
	TAUMX	-	62EQ	160=	165=														
	TAUMY	-	62EQ	161=	165	167=													
	TAUV	-	12C0																
	TAUPL	-	12C0																
	TAURPL	-	33C0	114=	174=	175=	183=												
	TAUSAV	-	4D1	415=	418AG	430=	433=												
	TAUTO	-	43C0	256	336	408=	409=	410=											
	TAUTOZ	-	38C0																
	TAUW	-	9C0	256															
	TAUWDM	-	24C0																
	TAUWDP	-	36C0	114=	336														
	TAUWX	-	38C0																
	TAUWY	-	38C0																
	TAUZ	-	36C0	112=	163	232	276	307	336	358	389	404	415	419	425WR				
	TAUZTO	-	433																
	TAUZTO	-	36C0	113=	309														
	TBLAKR	-	14C0	128AG															
	TBLCH	-	19C0	125AG															
	TBLPA	-	19C0	126AG															
	TCOMB	-	16C0	79AG	249AG	394AG													
	TEREC	-	6C0																
	THO	-	10C0																
	THSLV	-	40C0																
	THSLVV	-	40C0																
	TIMAKR	-	14C0	128AG															
	TIMAX	-	19C0	411	440	442													
	TIMCK1	-	28C0	210WR															
	TIMCK2	-	30C0	210WR															

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I N D E X

SUBROUTINE MNCHN4

PAGE 264

TIME	-	45C0	83=	125A6	126AG	128A6	203	204	214	218	269	270	278	150
		404	411	425WR	442	453	461	465						
TIMECM	-	19C0	125AG											
TIMEPA	-	19C0	126AG											
TIMEPH	-	15C0	453											
TIMEW	-	34C0												
TMA	-	58C0												
TO	-	53C0	79AG	81	82	249AG	254	288	289	377	392	394AG	399=	
TOFLAG	-	43C0	210WR	257=	265=	337=	344=							
TOTEMP	-	392=	399											
TPR	-	41C0	68=	122=										
TSLVDM	-	40C0												
TSLVR	-	10C0	326	327										
TSLVRX	-	39C0	326=											
TSLVRY	-	39C0	327=											
TSKEC	-	6C0												
TWEB	-	6C0												
TIB	-	59C0	360											
U	-	45C0	223=	286=	287	291	299	383						
UT	-	34C0	82=											
UTMP	-	290=	291											
UIA	-	58C0												
UIB	-	58C0	361											
V	-	37C0	450											
VAR1	-	421=												
VCH	-	25C0	102=	267										
VCHINP	-	17C0	102											
VCH	-	26C0	103=	379										
VCNA	-	56C0												
VCNB	-	56C0												
VCNINA	-	23C0												
VCNINB	-	23C0												
VCNINP	-	17C0	103											
VEH	-	46C0												
VF	-	36C0	242=	332=										
VFH	-	46C0	95=	185	186=	187=	242	267	277					
VFH0	-	25C0	95											
VFHPR	-	185=	186	277										
VFINT	-	46C0												
VFN	-	46C0	96=	194=	195=	201=	332	379						
VFNA	-	56C0	98=	197=	199=	201								
VFNB	-	56C0	99=	198=	200=	201								
VFNO	-	26C0	96											
VFNOA	-	23C0	98											
VFNOB	-	23C0	99											
VFPP	-	38C0												
VFWEB	-	48C0												
VGA	-	58C0												
VGAZ	-	58C0												
VIS	-	46C0												
VP	-	36C0	225=											
VPH	-	47C0	267=	277										
VPN	-	47C0	379=											
VPR	-	37C0	450=											
VSLVR	-	40C0	332											

I N D E X

SUBROUTINE MNCHN4

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WD	-	48C0																
WDOT	-	43C0	224=	281=	286	290	303	386										
WDDTD	-	43C0	279=	280=	281													
WDDTI	-	34C0																
WGTOT	-	48C0																
WI	-	42C0																
* WORKA	-	24*																
* WORKKH	-	25*																
* WORKRN	-	26*																
WT	-	42C0																
XHARI	-	44C0																
XBAKIH	-	42C0																
XBH	-	35C0																
XBN	-	35C0																
XBNA	-	57C0																
XBNB	-	57C0																
XCGHD	-	12C0																
XCGN	-	12C0																
XCGNA	-	55C0																
XCGNB	-	55C0																
* XLIN	-	79*	80*	125*	126*	128*	248*	249*	250*	251*	393*	394*	395*	396*				
XO	-	27C0																
* XOWORK	-	27*																
XR	-	42C0																
X1	-	27C0																
X2	-	27C0																
X3	-	27C0																
Y0	-	27C0																
Y1	-	27C0	86=															
Y2	-	27C0																
Y3	-	27C0																
ZCALC	-	34C0	139	143	150	156	169											
THE			VARIABLE- ZEROV -IS USED BEFORE IT IS DEFINED															
ZEROV	-	277	266	267	288	289	290	291										
Z0	-	27C0																
Z1	-	27C0																
Z2	-	27C0																
Z3	-	27C0																

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I N D E X

SUBROUTINE MODISB(IE)

PAGE 267

```
40      55 CONTINUE
41      32 IF (PONBAR.GT.0.0) GO TO 34
42      GO TO 40
43      34 ER=ERBAR*(PON/PONBAR)**EREXP
44      IF (TIME.LT.DELT) DELOT=0.0
45      DELOT=DELOT+ER*DELT**2.
46      GO TO 46
47      40 IF (NDT) 42,42,44
48      42 DELOT=0.0
49      GO TO 46
50      44 CALL XLIN(TIMEOT,TDELOT,VDOT,TIME,DELOT,26)
51      46 OT = DTINI+DELOT
52      AT=PI*OT**2/4.
53      RETURN
54      END
```

SYMBOL	-----	REFERENCES	-----
10	-	20	21*
20	-	21	22*
32	-	39	41*
34	-	41	43*
40	-	42	47*
42	-	47	48*
44	-	47	50*
46	-	46	49
50	-	20	21
52	-	34	37*
55	-	2500	39
ABCYL	-	1200	
ACCEL	-	1200	
AMH	-	1300	
AJNC	-	1000	23=
AJNCHI	-	1200	
AJNCIN	-	300	26
AJNCw	-	1700	27
AJNCX	-	1400	26=
AJNCY	-	1400	27=
AJBHED	-	1300	
AJBHN	-	1300	
AJBNUZ	-	1300	
AJPHED	-	1300	
AJPHN	-	1300	
AJPNQZ	-	1300	
AK6Y	-	1700	
AKRST	-	1700	
ALA	-	300	
ALADM	-	1000	
ALB	-	300	
ALMUM	-	1000	
ALE	-	300	
ALUDM	-	1000	
ALS1	-	300	
ALS1DM	-	1000	
ALS2	-	300	
ALS2DM	-	1000	
AMACH	-	1200	
AMPN	-	1700	
AMW	-	1700	
AN180	-	1200	
ANLOPS	-	1200	
ANN	-	600	
ANO	-	300	
ANODM	-	1000	
ANOX	-	1400	
ANDY	-	1400	
AN2	-	600	
A01	-	300	
A02	-	300	
A03	-	300	
A04	-	300	

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SUBROUTINE MODTSA(IE)

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I N D E X

SUBROUTINE MODTSB(IE)

PAGE 270

NTABE	-	16C0		
NTME	-	16C0		
P	-	17C0		
* PARMB	-	16*		
* PARMF	-	17*		
* PARMS	-	18*		
PH	-	17C0		
P1	-	2C0	52	
P102	-	2C0		
PMAX	-	16C0		
PMIN	-	16C0		
PON	-	17C0	43	
PONBAR	-	7C0	41	43
PRNT	-	12C0		
RADIAN	-	2C0		
* RETURN	-	22*	38*	53*
RF	-	3C0		
RFDUM	-	10C0		
RFX	-	14C0		
RFY	-	14C0		
RSLVRN	-	14C0		
R2	-	3C0		
R2DM	-	10C0		
R3	-	3C0		
R3DM	-	10C0		
R4	-	3C0		
R4DM	-	10C0		
R5	-	3C0		
R5DM	-	10C0		
R6	-	3C0		
R6DM	-	10C0		
R7	-	3C0		
R7DM	-	10C0		
R8	-	3C0		
R8DM	-	10C0		
SCUR	-	16C0		
STDYST	-	8C0		
STFLAG	-	8C0	20	
T	-	17C0		
TAUAD	-	13C0		
TAUTO	-	16C0		
TAUTOZ	-	14C0		
TAUW	-	3C0	28	29
TAUWDM	-	10C0		
TAUWX	-	14C0	28=	
TAUWY	-	14C0	29=	
TDELDT	-	7C0	50AG	
IHO	-	4C0		
TIME	-	17C0	44	50AG
TIMEDT	-	7C0	50AG	
TIMEW	-	12C0		
* TISUB	-	37*		
TOFLAG	-	16C0		
TSLVR	-	4C0	32	33
TSLVRX	-	15C0	32=	

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I N D E X

SUBROUTINE MODTSB(IE)

PAGE 271

ISLVRY	-	15C0	33=
U	-	17C0	
UT	-	12C0	
VFPP	-	14C0	
WDOT	-	16C0	21
WDOTD	-	16C0	
WDOTI	-	12C0	
* WOKKA	-	10"	
XBH	-	13C0	
XBN	-	13C0	
* XLIN	-	50"	
ZCALC	-	12C0	

```

1      SUBROUTINE MSISUB                                73760
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 73870
C      SUBROUTINE MSISUB DETERMINES THE LOCATION OF THE CENTER OF GRAVITY 73890
C      AND THE POLAR AND RECTANGULAR MOMENT OF INERTIA FOR THE BLOCK 2A 73900
C      ANALYSIS OF THE HEAD-END WITH WEB. 73910
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 73930
2      COMMON/CONSTS/GNOT,PI,P102,RADIAN
3      COMMON/INPUTA/BTAOE,DH1,BH,AOHM,RIG,HHR
4      COMMON/INPUTU/DELTA,PA,PHI,HCO,DELTA,KDUMP(72)
5      COMMON/COMC/AMTJ,AMTI,AJPHO,AJSHO,XBIH,ALQ
6      COMMON/COMF/TAUWEI,XCGA,XCGH,ZRO,ACGA,ACGH,RCGO,ZCG,YCG,YRO,YI
7      COMMON/COMF/AMSI,AMSJ
8      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASF,AFF,WI,WT,PA,
1      RAO,ALL,AJPP,ASI
9      COMMON/PARMH/B1E,BOE,AAHV,BX,RXX,ASII,DELLRI,ROPE4,AIE,YPI,ZPI,
1     ARCO,ARCI,RCEI,ALITTL,ZI,AIG,THRI,THRO,AOF
10     COMMON/PARMJ/WTM
11     10 YI=SQRT(AIE**2-ZI**2/BH**2)                                73950
12     20 TAUWEI=SQRT((ZI-ZPI)**2+(YI-YPI)**2)                        73960
13     30 XCGA=(ROE1+TAUWEI)*2.*SIN((ARCI-ARCO)/2.)/(3.*(ARCI-ARCO)/2.) 73970
14     40 XCGH=(ROE1+TAU)*XCGA/(ROE1+TAUWEI)                        73980
15     50 ZRO=ZPI-ROE1*SIN(ARCI)                                    73990
16     60 YRO=YPI-ROE1*COS(ARCI)                                    74000
17     70 ACGA=(ROE1+TAUWEI)**2*(ARCI-ARCO)/2.                      74010
18     80 ACGH=(ARCI-ARCO)*(ROE1+TAU)**2/2.                        74020
19     90 RCGO=(XCGA*ACGA-XCGH*ACGH)/(ACGA-ACGH)                  74030
20     100 ZCG=ZRO+RCGO*SIN((ARCI+ARCO)/2.)
21     110 YCG=YRO+RCGO*COS((ARCI+ARCO)/2.)
22     120 AMSI=(ACGA-ACGH)*2.*3.14159*ZCG**3*DELTA/GNOT          74060
23     WI=(ACGA-ACGH)*2.*3.14159*DELTA*ZCG                        74070
24     WTH=WI+WI                                                    74080
25     WTH=WTH+WTH                                                  74090
26     XBARIH=(WT*XBARIH+WTH*YCG)/WT                                74100
27     130 AMSJ=AMSI/2.+(ACGA-ACGH)*2.*3.14159*ZCG*DELTA*(YCG+HCO)**2/GNOT 74110
28     RETURN                                                        74120
29     END

```

SYMBOL	-----	REFERENCES	-----
10	-	11*	
20	-	12*	
30	-	13*	
40	-	14*	
50	-	15*	
60	-	16*	
70	-	17*	
80	-	18*	
90	-	19*	
100	-	20*	
110	-	21*	
120	-	22*	
130	-	27*	
AANN	-	9C0	
ACGA	-	6C0	17* 19 22 23 27
ACGB	-	6C0	13* 19 22 23 27
AFF	-	8C0	
AIG	-	9C0	
AJBHU	-	5C0	
AJPHO	-	5C0	
AJPP	-	8C0	
AL	-	8C0	
ALITL	-	9C0	
ALL	-	8C0	
ALQ	-	5C0	
AMS1	-	7C0	22* 27
AMSJ	-	7C0	27*
AMT1	-	5C0	
AMTJ	-	5C0	
AOE	-	9C0	
AOHM	-	3C0	
ARCO	-	9C0	13 17 18 20 21
ARC1	-	9C0	13 15 16 17 18 20 21
ASE	-	8C0	
ASI	-	8C0	
ASI1	-	9C0	
AI E	-	9C0	11
BH	-	3C0	11
BOE	-	9C0	
BTAOE	-	3C0	
BX	-	9C0	
B1E	-	9C0	
* COMC	-	5*	
* COME	-	6*	
* COMF	-	7*	
* COMI	-	8*	
* CONSTS	-	2*	
* COS	-	16	21
DELF	-	4C0	22 23 27
DELLRI	-	9C0	
DELZ	-	4C0	
OH1	-	3C0	
GNOT	-	2C0	22 27

HCO	-	4C0	27						
HE	-	8C0							
HHR	-	3C0							
* INPUTA	-	3*							
* INPUTU	-	4*							
KDUMP	-	4C0							
* MSISUB	-	1*							
PA	-	4C0							
* PARMH	-	9*							
* PARMJ	-	10*							
PHI	-	4C0							
PI	-	2C0							
PI02	-	2C0							
RA	-	8C0							
RADIAN	-	2C0							
RA0	-	8C0							
RC	-	8C0							
KCGU	-	6C0	19=	20	21				
* RETURN	-	28*							
RIG	-	3C0							
KOE1	-	9C0	13	14	15	16	17	18	
ROPT4	-	9C0							
RXX	-	9C0							
* SIN	-	13	15	20					
* SQR1	-	11	12						
SUMDV	-	8C0							
TAU	-	8C0	14	18					
TAUWEI	-	6C0	12=	13	14	17			
THP1	-	9C0							
THRO	-	9C0							
WI	-	8C0	23=	24	26				
WI	-	8C0	24=	25	26				
WTH	-	10C0	25=						
XBAR1H	-	8C0	26=						
XBIH	-	5C0							
ACGA	-	6C0	13=	14	19				
ACGR	-	6C0	14=	19					
AR	-	8C0							
YCB	-	6C0	21=	26	27				
YI	-	6C0	11=	12					
YP1	-	9C0	12	16					
YRD	-	6C0	16=	21					
ZCG	-	6C0	20=	22	23	27			
ZI	-	9C0	11	12					
ZP1	-	9C0	12	15					
ZRO	-	6C0	15=	20					

	1	SUBROUTINE MTISUB	74190
	C	CCC	74260
	C	SUBROUTINE MTISUB DETERMINES THE LOCATION OF THE CENTER OF GRAVITY	74280
	C	AND THE POLAR AND RECTANGULAR MOMENT OF INERTIA FOR THE BLOCK 2B	74290
	C	ANALYSIS OF THE HEAD END WITH WEB.	74300
	C	CCC	74320
2		COMMON/CUNTS/GNOT,PI,PIO2,RADIAN	
3		COMMON/INPUTA/BTAE,DH1,JN,AOHM,RIG,HHR	
4		COMMON/INPUTU/DELTA,PA,PBI,HCO,DELT,Z,KDUMP(72)	
5		COMMON/COMC/AMTJ,AMTI,APPHO,ABHO,XBH,ALO	
6		COMMON/COME/TAUWEI,XCGA,XCBG,ZRO,ACGA,ACGB,RCGO,ZCG,YCG,YRO,YI	
7		COMMON/COMT/TAU,RC,SUMDV,XH,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,	
	1	RAG,ALL,APPP,AST	
8		COMMON/PARMH/BIE,BOE,AANN,RX,RXX,ASII,DELLHI,ROPE4,AIE,YPI,ZP1,	
	1	ARCO,ARCI,ROI,ALIITL,ZI,AIG,THRI,THRO,AOE	
9		COMMON/PARMJ/WTH	
10	10	YI=SQRT(AIE**2-ZI**2/H**2)	74340
11	20	TAUWEI=SQRT((ZI-ZP1)**2+(YI-YPI)**2)	74350
12	30	XCGA=(ROI1+TAUWEI)*2.*SIN((ARCI-ARCO)/2.)/(3.*(ARCI-ARCO)/2.)	74360
13	40	XCBG=XCGA*(ROI1+TAUI)/(ROI1+TAUWEI)	74370
14	50	ZRO=ZP1-ROI1*SIN(ARCI)	74380
15	60	YRO=YPI-ROI1*COS(ARCI)	74390
16	70	ACGA=(ROI1+TAUWEI)**2*(ARCI-ARCO)/2.	74400
17	80	ACGB=(ARCI-ARCO)*(ROI1+TAU)**2/2.	74410
18	90	RCGO=(XCGA*ACGA-XCBG*ACGB)/(ACGA-ACGB)	
19	100	ZCG=ZRO+RCGO*SIN((ARCI+ARCO)/2.)	
20	110	YCG=YRO+RCGO*COS((ARCI+ARCO)/2.)	
21	120	AMTI=ZCG**3*(THRI+THRO)*SELF*AANN*(ACGA-ACGB)/GNOT	74450
22		WI=(ACGA-ACGB)*(THRI+THRO)*SELF*AANN*ZCG	74460
23		WT=WT-WI	74470
24		WTH=Wt	74480
25		AJHHO=0.0	
26		AJPHO=0.0	
27		XBARIH=(WI*XBARIH-WI*YCG)/WT	74510
28		XBIIH=XBARIH	74520
29	130	AMTJ=(ACGA-ACGB)*AANN*SELF*ZCG*(THRI+THRO)*(YCG+HCO)**2	74530
		X/GNOT+AMTI/2.	74540
30		RETURN	74550
31		END	

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SYMBOL	-----	REFERENCES	-----
10	--	10*	
20	--	11*	
30	--	12*	
40	--	13*	
50	--	14*	
60	--	15*	
70	--	16*	
80	--	17*	
90	--	18*	
100	--	19*	
110	--	20*	
120	--	21*	
130	--	29*	
AANN	--	8C0	21 22 29
ACGA	--	6C0	16= 18 21 22 29
ACGB	--	6C0	17= 18 21 22 29
AFF	--	7C0	
AIG	--	8C0	
AJBHO	--	5C0	25=
AJPHO	--	5C0	26=
AJPP	--	7C0	
AL	--	7C0	
ALITTL	--	8C0	
ALL	--	7C0	
ALQ	--	5C0	
AMT1	--	5C0	21= 29
AMTJ	--	5C0	29=
AOE	--	8C0	
AOHM	--	3C0	
AHCO	--	8C0	12 16 17 19 20
ARC1	--	8C0	12 14 15 16 17 19 20
ASE	--	7C0	
ASI	--	7C0	
AS11	--	8C0	
A1E	--	8C0	10
BH	--	3C0	10
BOE	--	8C0	
BTAOL	--	3C0	
DX	--	8C0	
B1E	--	8C0	
* COMC	--	5*	
* COME	--	6*	
* COMT	--	7*	
* CONSTS	--	2*	
* COS	--	15	20
UELF	--	4C0	21 22 29
UELLRI	--	8C0	
UELZ	--	4C0	
UH1	--	3C0	
GNOT	--	2C0	21 29
HCU	--	4C0	29
HE	--	7C0	
HHR	--	3C0	

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31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056

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1  SUBROUTINE NSCE(IOPT)
2  IMPLICIT REAL (A-H,O-Z,M)
   C  IOPT=1  CORRECT FOR CONTOUR EFFECTS AND RETURN
   C  IOPT=2  STEADY STATE CALCULATIONS AND RETURN
   C  IOPT=3  NON STEADY STATE CALCULATIONS AND RETURN
3  COMMON/CONSTS/GNOT,PI,PI02,RADIAN
4  COMMON/INPUT4/NGEO(18),APORT(18),TAUPL(50,18),ALPPL(50,18),
   1  AKGYP(50,18),TAUHD(50),ABHD(50),PMUHD(50),
   2  RMOHD(50),XCGHD(50),TAUN(50),ABN(50),PMOIN(50),
   3  RMOIN(50),XCGN(50),NGEOHD,NGEOMN
5  COMMON/INPUTG/CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
   1  AMWG(20),TCOMB(20),NCSCOE
6  COMMON/INPUTI/AN2,CM,DE,DT,ANN
7  COMMON/INPUTO/KPLANE,KVOICS
8  COMMON/INPUTU/DELTA,PA,PHI,HCO,DELZ,KDUMP(72)
9  COMMON/COMA/DELT,APHI,WDOTI,ANI80,TIMEW,UT,ANLOPS,ACCEL,
   1  ABCYL,PRNT(101,15),AINCHI,AMACH,ZCALC(101)
10 COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RBZTO(101),PD(101),
   1  TAUWDP(101),RB,VF,DWDOT,VP
11 COMMON/PARM8/AP,PMIN,PMAX,WDOT,III,IJJ,WDOTD,NSLOT,NTABE,NTME,
   1  TAUZO,TOFLAG,NINCPL,BRNOU,IIIS,IS1,IS2,N1,SCUR(18,2)
12 COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,POV,DIS,AMPN,AT,
   1  AMW,AKRST
13 COMMON/PARMS/ICHN
14 COMMON/PARMZ/ABSL0T,PO
15 COMMON/PARMA4/TO,IFLAG
16 COMMON/PARMAG/ TXSUB(20),TRSUB(20),NPSUB
17 COMMON/PARMAH/ VNQZSB,THETEX,SIRATC,NCONT
18 COMMON/PARMAI/ VFNA,VFNB,VCNA,VCNB
19 COMMON/PARMAJ/ AANA,AAVA,AJPNZA,AJPNZB,AJBNZA,AJBNZB,XRNA,XBNH
20 COMMON/PARMAK/PIAT,AENT,JIA,PIA,P1B,AZA,VGA,PMA,PMAZ,TMA,VGAZ,
   1  MDBETA,U1B,A1A,M01B
21 COMMON/PARMAL/DWDOTA,DWDOTB,DWDOTC,DWDOTD,P1BT,T1B,M1B
22 COMMON/PARMA4/ A1B,A2B
23 COMMON/DUMYD/TIMP,UTMP
24 COMMON/DUMYX/ VGBZ,PMBZ,VGH,TIMEZ,PMB,IPASS
   C  NAMELISTS USED FOR DEBUG PRINT
25 NAMELIST/NP1B/ ITP1B,P2BT,R01B,RB2B,DWDOT,UTMP,TIMP,PTMP,RH01B,
   1  RHOTMP,AR,AT,AENT,A1A,A2A,TO,GAMA,R,DT,PI
26 NAMELIST/NP2B/ ITP2B,R01A,RB2A,DWDOT,MDBETA,MBETA,THETA,CHETA,
   1  UBETA,PBETA,POV
27 NAMELIST/NP3B/ ITP1B,C1B,M1B,T1B,P1B,VGA,VGAZ,VGB,VGBZ,PMA,PMAZ,
   1  PMB,PMBZ,RB1B,P2BT,DWDOT,TMB,DWDOT,M01B,U1B,UMB,P1B,TFMP,
   1  AR,AT,AENT,A1A,A2A,TO,R,GAMA,DT,PI,VCNA,VCNB,VFNA,VFNB,VN0ZSB
28 NAMELIST/NP4B/ ITP1B,U1B,TO,GAMA,R,T1B,T1B,TEMP
29 NAMELIST/NP5B/ ITP2B,RB1A,PIA,P1B,RB2A,DWDOT,TMA,MDBETA,DWDTA,
   1  MBETA,TBETA,CHETA,UBETA,UMA,PBETA,PMA,PMAZ
   C
30 GO TO (10,100,100),IOPT
   C
31 10 IF (THETEX.EQ.0.0 .AND. SIRATC.EQ.0.0) GO TO 15
32 IF (THETEX.GT.0.0 .AND. SIRATC.GT.0.0) GO TO 15
33 IF (THETEX.GT.0.0) AN2=(AN2+THETEX)/2.0
34 IF (SIRATC.LE.0.0) GO TO 11
35 AN2R=PI*AN2/180.

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36      AN2R=ACOS(SIRATC*(COS(AN2R)+1.0)-1.0)
37      AN2=(180.*AN2R)/PI
38      11 CONTINUE
39      RETURN
40      15 WRITE(6,16) THETEX,SIRATC
41      16 FORMAT('1 ERROR IN DATA INPUT TO NSCE, IOPT=1',/,' THETEX=',F15.8,
42      & 5X,'SIRATC=',E15.8)
43      GO TO 9000
44      C STEADY STATE CALCULATIONS
45      100 CONTINUE
46      C INITIALIZATION
47      IF(TIME.GT.0.0) GO TO 105
48      AT=PI*DT**2/4.0
49      P1B=PA
50      DWDOTB=0.0
51      DWDIA=0.0
52      DWDIB=0.0
53      P1BT=PA
54      I1B=T
55      M1B=0.0
56      TIMEZ=0.0
57      PMA=PA
58      PMH=PA
59      VGA=VCNA-VFNA
60      VGB=VCNB-VFNB-VNOZSH
61      105 T1A=T
62      U1A=U
63      P1AT=PO
64      P1A=P
65      ITP1B=0
66      ITP2B=0
67      ITP1B=0
68      AENT=PI*TRSUB(1)**2
69      AR=AENT/AT
70      A1A = APORT(KPLANE)
71      AZA=A1B+AENT
72      C*** PRELIMINARY CALCULATIONS FOR REGION B
73      IF(NCSTR.LE.0) GO TO 110
74      CALL XLIN(PRESS,TCOMB,NCSTR,PIAT,T0,31)
75      CALL XLIN(PRESS,GAMAG,NCSTR,PIAT,GAMA,32)
76      CALL XLIN(PRESS,AMWG,NCSTR,PIAT,AMW,33)
77      H=1545.864/AMW
78      P2BT=P1AT
79      RHO1B = P2BT/(12.*R*T0)
80      P=P2BT
81      CALL RHSUB
82      DWDOT=RB*AANB*DELF
83      U1B = -DWDOT/(12.*RHO1B*A1B)
84      IF(IOPT.EQ.1) GO TO 190
85      UTMP=U1B
86      P1B=P2BT-.5*RHO1B*U1B**2
87      P1MP=P1B
88      RHO1MP=RHO1B
89      IF(U1B.GE.0.0) GO TO 120
90      RHO1MP=-DWDOT/(12.*UTMP*A1B)

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C*** ITERATION LOOP
87   120 P=P2BT
88     CALL RBSUB
89     RB2B=RB
90     P=PTMP
91     CALL RBSUB
92     RB1B =RB
93     IF (NCSTR.LE.0) GO TO 130
94     CALL XLIN(PRESS,TOMB,NCSTR,PTMP,TO,34)
95     CALL XLIN(PRESS,GAMAG,NCSTR,PTMP,GAMA,35)
96     CALL XLIN(PRESS,AMWG ,NCSTR,PTMP,AMW,36)
97     R=1545.864/AMW
98   130 DWDOT=(RB1B+RB2B)/2. * AANB*DELF
99     RBZ(NI+2)=(RB1B+RB2B)/2.0
100     DWDOTB = DWDOT
101     RBZTO(NI+2)=RBZ(NI+2)
102     UTMP= -DWDOT/(12.*RHOTMP*A1B)
103     TTMP= TO-(GAMA-1.0)*UTMP**2/(2.*GNOT*R*GAMA)
104     PTMP= P2BT + 2.*DWDOT*UTMP/(GNOT*(A1B+A2B))
105     RH01B=PTMP/(12.*R*TTMP)
106     TEMP = RHOTMP-RH01B
C
107     IF (ABS(TEMP)/RHOTMP .LE. .0001) GO TO 140
108     RHOTMP = RH01B
109     ITPIB = ITPIB + 1
110     IF (ITPIB.LE.21) GO TO 120
111     WRITE(6,1000) PTMP,RH01B,RHOTMP
112   1000 FORMAT(' ',30(' '),/ ' *** ERROR IN NSCE STEADY STATE CALCULATION-
    $REGION B - PRESSURE ITERATION FAILED' /' PTMP=',F10.4,3X,' RH01B=',
    $F10.8,3X,' RHOTMP=',F10.4,/ ' ',30(' '))
    GO TO 9000
113
114   140 PIB=PTMP
115     T1B=TTMP
116     U1B=UTMP
117     M1B=SQRT((2.*(TO-T1B))/(GAMA-1.0)*T1B))
118     MD1B=DWDOT
119     PIBT=PIB*(1.+(GAMA-1.)/2.*M1B**2)**(GAMA/(GAMA-1.0))
C*** SECTION A CALCULATIONS
120   150 P=P1A
121     CALL RBSUB
122     RB1A=RB
123     P=P1B
124     CALL RBSUB
125     RB2A=RB
126     DWDOT=(RB1A+RB2A)/2. * AANA*DELF
127     RBZ(NI+1)=(RB1A+RB2A)/2.0
128     DWDOTA = DWDOT
129     RBZTO(NI+1)=RBZ(NI+1)
130     MD0E(A=WDOT + DWDOT + MD1B
131     IF (NCSTR.LE.0) GO TO 160
132     CALL XLIN(PRESS,TOMB,NCSTR,P1A,TO,37)
133     CALL XLIN(PRESS,GAMAG,NCSTR,P1A,GAMA,38)
134     CALL XLIN(PRESS,AMWG ,NCSTR,P1A,AMW,39)
135     R=1545.864/AMW
136     TMA=1.0

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137      CALL SUBSON(ICHOKE,IORT)
138      IF(ICHOKE.EQ.0) GO TO 170
139      160 CALL MACH(AR,GAMA,MBETA)
140      TBETA = TO/(1.+(GAMA-1.)/2.*MBETA**2)
141      CBETA = SQR(3NOT*GAMA*H*THETA)
142      UBETA = CBETA*MBETA
143      PBETA = (1./AENT)*((1./GNOT)*(WDOT*U-MDBETA*UHETA+MDIB*UIB) +
      $ P1A*A1A-P1B*A1B + (P1A+P1B)/2. *. (A2A-A1A))
144      PON =PBETA*(1.+(GAMA-1.)/2.*MBETA**2)**(GAMA/(GAMA-1.))
      C*** CHECK FOR CONVERGENCE
      C      WRITE(6,NP2B)
145      170 IF(ABS(PON-P1BT)/P1BT.LE.0.0001) GO TO 300
146      ITP1H=0
147      IF(ITP2B.GT.0) GO TO 180
148      P2OLD=P2BT
149      IF(PON.LT.P1BT ) P2BT=P2BT*0.99
150      IF(PON.GT.P1BT ) P2BT=P2BT*1.01
151      PRABO=P1BT/PON
152      ITP2B=ITP2B+1
153      GO TO 120
154      180 PRAHN=P1BT/PON
155      SLOPE=(P2OLD-P2BT)/(PRABO-PRAHN)
156      BINT = P2BT-SLOPE*PRAHN
157      PRABO=PRAHN
158      P2OLD = P2BT
159      P2BT = SLOPE*BINT
160      ITP2B = ITP2B + 1
161      IF(ITP2B.LT.21) GO TO 120
162      WRITE(6,1010) P1P,P1B,P2BT,PBETA
163      1010 FORMAT(' ',30(' '),/ ' *** ERROR IN NSCE STEADY STATE CALCULATIONS
      $- REGION A - PRESSURE ITERATION FAILED',/ ' PTMP= ',F10.4,'3X,'P1B= ',
      $F10.4,'3X,'P2BT= ',F10.4,'3X,'PBETA= ',F10.4,'/ ' ',30(' '))
164      GO TO 9000
      C*** NON-STEADY STATE CALCULATIONS-PRELIMINARY
165      190 IF(TIME.EQ.0.0) RETURN
166      C1B=SQRT(GAMA*GNOT*RTD)
167      M1B=ABS(U1B/C1B)
168      T1BG=TO/(1.+(GAMA-1.)*M1B**2/2.0)
169      P1BG=12.*RHO1B*RT1BG
170      IF(TIME.EQ.TIMEZ) GO TO 195
171      TIMEZ=TIME
172      IPASS=0
173      195 IPASS=IPASS+1
174      IF(IPASS.GT.1) GO TO 198
175      VGAZ=VGA
176      VGBZ=VGB
177      PMAZ=PMA
178      PMBZ=PMB
179      198 VGA=VCNA-VFNA
180      VGB=VCNB-VFNB-VNOZSB
      C*** NON-STEADY STATE CALCULATION-ITERATION LOUP
      C*** REGION B ITERATIONS
181      200 P=P1BG
182      CALL RBSUB
183      RB1B=RB

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184 P=P2BT
185 CALL RBSUB
186 RBZB=RB
187 DWDOT=(RB1B+RB2B)*AANB*DELF/2.0
188 RBZ(NI+2)=(RB1B+RB2B)/2.0
189 DWDOTB = DWDOT
C*** MASS STORAGE TERMS
190 PMB=(P1BG + P2BT)/2.0
191 TMB=(T1BG + T0)/2.0
192 DWDI=( 1./((12.*R*TMB*DELT)))*(2.*PMB*VGB-PMB*VGB7-PMRZ*VGR)
193 DWDIB=DWDI
194 MD1B=DWDOT-DWDI
195 U1B=-MD1B*R*T1BG/(P1BG*A1B)
196 UMR=U1B/2.0
197 TERM1=VGB*UMB*(PMB-PMBZ)/((12.*GNOT*R*TMB*DELT)
198 TERM2=PMB*U1B*(VGB-VGBZ)/((12.*GNOT*R*TMB*DELT)
199 P1B=P2BT+(2./{A1B+A2B})*(TERM1+TERM2+U1B*MD1B/GNOT)
200 TEMP=P1B-P1BG
C
201 IF(ABS(TEMP)/P1BG.LE.0.0001) GO TO 230
202 IF(ITP1B.GT.0) GO TO 210
203 P1B0=P1BG
204 P1BC=P1B
205 P1BG=P1BG*0.99
206 ITP1B=ITP1B+1
207 GO TO 200
208 210 ITP1B=ITP1B+1
209 IF(ITP1B.LE.21) GO TO 220
210 WRITE(6,1020) P1B,P1BG,T1BG
211 1020 FORMAT(' ',30(' '),/ ' *** ERROR IN NSCE'NON-STEADY STATE CALCULAT
ION-REGION B - PRESSURE ITERATION FAILED'/) P1B='F10.4.3X.'P1BG='
',F10.8.3X.'T1BG='F10.4/' ',30(' ')
GO TO 9000
212
213 220 SLOPE=(P1BG-P1B0)/(P1B/P1BG-P1BC/P1B0)
214 BINT=P1BG-SLOPE*P1B/P1BG
215 P1BC=P1B
216 P1B0=P1BG
217 P1BG=SLOPE+BINT
218 GO TO 200
219 230 U1B=-MD1B*R*T1BG/(P1B*A1B)
220 IF(INCSTR.LE.0) GO TO 240
221 CALL XLIN(PRESS,TCONB,NCSTR,P1B,TU,40)
222 CALL XLIN(PRESS,GAMAG,NCSTR,P1B,GAMA,41)
223 CALL XLIN(PRESS,AMWG,NCSTR,P1B,AMW,42)
224 R=1545.864/AMW
225 240 T1B=T0 - (GAMA-1.)*U1B**2/(2.*GNOT*GAMA*R)
226 TEMP=T1BG-T1B
C
227 IF(ABS(TEMP)/T1BG.LE.0.001 ) GO TO 270
228 IF(ITT1B.GT.0) GO TO 250
229 T1B0=T1BG
230 T1BC=T1B
231 T1BG=T1BG*0.995
232 ITP1B=0
233 P1BG=P1B

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234      ITT1B=ITT1B+1
235      GO TO 200
236 250 ITT1B=ITT1B+1
237      IF (ITT1B.LE.11) GO TO 260
238      WRITE(6,1030) T1B,T1BG,P1B
239 1030 FORMAT(' ',30(' '),/,' *** ERROR IN NSCE NON-STEADY STATE CALCULAT
      $ION-REGION H - TEMPERATURE ITERATION FAILED)/' T1B=',F10.4,3X,
      $*T1BG=',F10.8,3X,*P1B=',F10.4/' ',30(' '))
240      GO TO 9000
241 260 SLOPE=(T1BG-T1B0)/(T1B/T1BG-T1B0/T1B0)
242      BINT=T1BG-SLOPE*T1B/T1BG
243      T1BG=SLOPE*BINT
244      P1BG=P1B
245      ITP1B=0
246      GO TO 200
247 270 M1B=ABS(U1B/SQRT(GNOT*GAMA*R*T1B))
248      RH01B=P1B/(12.*R*T1B)
249      P1BT=P1B*(T0/T1B)**(GAMA/(GAMA-1.))
C*** NON-STEADY STATE CALCULATIONS FOR REGION A
250      IF (NCSTR.LE.0) GO TO 280
251      CALL XLIN(PRESS,TCOMH,NCSTR,P1A,T0,43)
252      CALL XLIN(PRESS,GAMAG,NCSTR,P1A,GAMA,44)
253      CALL XLIN(PRESS,AMWG,NCSTR,P1A,AMW,45)
254      R=1545.864/AMW
255 280 PMA=(P1A+P1B)/2.0
256      P=P1A
257      CALL RBSUB
258      RB1A=RB
259      P=P1B
260      CALL RBSUB
261      RB2A=RB
262      DWDOT=(RB1A+RB2A)/2. *AANA*DELF
263      RB2(NI+1)=(RB1A+RB2A)/2.0
264      DWDOTA = DWDOT
265      TMA=(T1A*DWDOT+T0*DWDOT+T1B*MD1B)/(DWDOT+DWDOT*MD1B)
266      MDBETA = WDOT+DWDOT*MD1B - VGA*(PMA-PMAG)/(12.*R*TMA*DELT)
      $ -PMA*(VGA-VGAZ)/(12.*R*TMA*DELT)
267      DWDTA = (VGA*(PMA-PMAG)+PMA*(VGA-VGAZ))/(12.*R*TMA*DELT)
268      CALL SUBSON(ICH0KE,IOPT)
269      IF (ICH0KE.EU.0) GO TO 285
270      CALL MACH(MR,GAMA,MHBETA)
271      THETA=T0/(1.+(GAMA-1.0)/2.*MHBETA**2)
272      CBETA=SQRT(GNOT*GAMA*R*TBETA)
273      UBETA=MBETA*CBETA
274      UMA=(U1A+UBETA)/2.0
275      PBETA= 1./AENT*(P1A*A1A-P1B*A1B+(P1A+P1B)
      $ *(A2A-A1A)/2.0 - VGA*(UMA*(PMA-PMAG)
      $ /(12.*GNOT*R*TMA*DELT)-PMA*UMA
      $ *(VGA-VGAZ)/(12.*GNOT*R*TMA*DELT)
      $ -UBETA*MDBETA/GNOT + U1A*WDOT/GNOT
      $ + U1B*MD1B/GNOT)
276      PON=PBETA*(1.+(GAMA-1.)/2.*MHBETA**2)**(GAMA/(GAMA-1.))
C
277 285 IF (ABS(PON-P1BT)/P1BT.LE.0.0001) GO TO 300
278      ITP1B=0

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279      ITTIB=0
280      IF (ITP2B.GT.0) GO TO 290
281      P2OLD=P2BT
282      IF (PON.LT.P1BT) P2BT=P2BT*0.99
283      IF (PON.GT.P1BT) P2BT=P2BT*1.01
284      PRABO=P1BT/PON
285      ITP2B=ITP2B+1
286      GO TO 200
287
290      PRABN=P1BT/PON
288      SLOPE=(P2OLD-P2BT)/(PRABO-PRABN)
289      BINT=P2BT-SLOPE*PRABN
290      PRABO=PRABN
291      P2OLD=P2BT
292      P2BT=SLOPE*BINT
293      ITP2B=ITP2B+1
294      IF (ITP2B.LT.21) GO TO 200
295      WRITE(6,1040) P2BT,P2OLD,PBETA,P1B,T1B
296      1040 FORMAT(' ',30(' '),/ ' *** ERROR IN NSCE NON-STEADY STATE CALCULAT
          SION-REGION A - PRESSURE ITERATION FAILED' / ' P2BT=',F10.4,'X,
          S',P2OLD=',F10.8,'X,'PBETA=',F10.4,'X,'P1B=',F10.4,'X,'T1B=',
          S'F10.4/ ' ',30(' '))
297      GO TO 9000
          C*** TOTAL CONVERGENCE ACHIEVED - SET VALUES AND RETURN
298      300 CONTINUE
299      WDOT=WDOTBETA
300      P=PBETA
301      PO=PON
302      U=UBETA
303      T=TBETA
304      AMACH = MHFTA
305      AP=A2A
306      DWDOT=DWDOTA
307      RH=RHZ(NI+1)
308      RETURN
309      9000 ICHN=5
310      RETURN
311      END

```

I N D E X

SUBROUTINE NSCL(IOPT)

PAGE 245

SYMBOL	-----	REFERENCES	-----
10	- 30 31*		
11	- 34 38*		
15	- 31 32 40*		
16	- 40WR 41*		
100	- 30 43*		
105	- 44 58*		
110	- 69 74*		
120	- 85 87*	110 153 161	
130	- 93 98*		
140	- 107 114*		
150	- 120*		
160	- 131 139*		
170	- 138 145*		
180	- 147 154*		
190	- 80 165*		
195	- 170 173*		
198	- 174 179*		
200	- 181* 207	218 235 246 286 294	
210	- 202 208*		
220	- 209 213*		
230	- 201 219*		
240	- 220 225*		
250	- 228 236*		
260	- 237 241*		
270	- 227 247*		
280	- 250 255*		
285	- 269 277*		
290	- 280 287*		
300	- 145 277	298*	
1000	- 111WR 112*		
1010	- 162WR 163*		
1020	- 210WR 211*		
1030	- 238WR 239*		
1040	- 295WR 296*		
9000	- 42 113	164 212 240 297 309*	
AANA	- 19C0 126	262	
AANB	- 19C0 78	98 187	
ABCYL	- 9C0		
ABHD	- 4C0		
ABN	- 4C0		
* AB5	- 107 145	167 201 227 247 277	
ABSL0T	- 14C0		
ACCEL	- 9C0		
THE VARIABLE= ACOS	- IS USED BEFORE IT IS DEFINED		
ACOS	- 36		
AEN1	- 20C0 25NM	27NM 65= 66 68 143 275	
AINCHI	- 9C0		
AINCW	- 12C0		
AJHNZA	- 19C0		
AJHNZB	- 19C0		
AJPNZA	- 19C0		
AJPNZB	- 19C0		
AKGY	- 12C0		

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I N D E X

SUBROUTINE NSCE(10PT)

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	RHO1B	-	25NM	75=	79	82	94	105=	106	108	111WR	169	248=		
	RMOIND	-	4CO												
	RMOIN	-	4CO												
	SCUR	-	11CO												
	SIRATC	-	17CO	31	32	34	36	40WR							
	SLOPE	-	155=	156	159	213=	214	217	241=	242	243	288=	289	292	
*	SQRT	-	117	141	166	247	272								
*	SUBSON	-	137*	268*											
	T	-	12CO	51	58	303=									
	TAUHD	-	4CO												
	TAUN	-	4CO												
	TAUPL	-	4CO												
	TAUTO	-	11CO												
	TAUWOP	-	10CO												
	TAUZ	-	10CO												
	TAUZTO	-	10CO												
	TBETA	-	26NM	29NM	140=	141	271=	272	303						
	TCOMB	-	5CO	70AG	94AG	132AG	221AG	251AG							
	TEMP	-	27NM	28NM	106=	107	200=	201	226=	227					
	TERM1	-	197=	199											
	TERM2	-	198=	199											
	THETEX	-	17CO	31	32	33	40WR								
	TIME	-	12CO	44	165	170	171								
	TIMEW	-	9CO												
	TIMEZ	-	24CO	53=	170	171=									
	TMA	-	20CO	29NM	136=	265=	266	267	275						
	TMB	-	27NM	191=	192	197	198								
	TD	-	15CO	25NM	27NM	28NM	70AG	75	94AG	103	117	132AG	140	166	168
		-	191	221AG	225	249	251AG	265	271						
	TOFLAG	-	11CO												
	TRSUB	-	16CO	65											
	TTMP	-	23CO	25NM	103=	105	115								
	TXSUB	-	16CO												
	T1A	-	58=	265											
	T1B	-	21CO	28NM	51=	115=	117	225=	226	230	238WR	241	242	247	248
		-	249	265	295WR										
	T1BC	-	230=	241											
	T1BG	-	27NM	28NM	168=	169	191	195	210WR	219	226	227	229	231=	238WR
		-	241	242	243=										
	T1BO	-	229=	241											
	U	-	12CO	59	143	302=									
	UBETA	-	26NM	29NM	142=	143	273=	274	275	302					
	UMA	-	29NM	274=	275										
	UMB	-	27NM	196=	197	198									
	UT	-	9CO												
	UTMP	-	23CO	25NM	81=	86	102=	103	104	116					
	U1A	-	20CO	59=	274	275									
	U1B	-	20CO	27NM	28NM	79=	81	82	85	116=	143	167	195=	196	199
		-	219=	225	247	275									
	VCNA	-	18CO	27NM	56	179									
	VCNB	-	18CO	27NM	57	180									
	VF	-	10CO												
	VFNA	-	18CO	27NM	56	179									
	VFNb	-	18CO	27NM	57	180									
	VGA	-	20CO	27NM	56=	175	179=	266	267	275					

VGAZ	-	3000	27NM	175*	266	267	275									
VGB	-	2400	27NM	57*	176	180*	192	197	198							
VGBZ	-	2400	27NM	176*	192	198										
VNOZSB	-	1700	27NM	57	180											
VP	-	1000														
WDOT	-	1100	130	143	265	266	275	299*								
WDOOTD	-	1100														
WDOOTI	-	900														
XBNA	-	1900														
XBNA	-	1900														
XCBH	-	400														
XCBH	-	400														
* XLIN	-	70*	71*	72*	94*	95*	96*	132*	133*	134*	221*	222*	223*	251*		
		252*	253*													
ZCALC	-	900														

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1      SUBROUTINE PCHWRT
      C
      C      NPUTAB=0 (NO GEOMETRY TABLE OUTPUT)
      C      NPUTAB=1 (PUNCH GEOMETRY TABLES)
      C      NPUTAB=2 (PUT GEOMETRY TABLES ON DISK WITH NAMELIST DATA)
      C      NPUTAB=3 (DO BOTH OF ABOVE)
      C
2      REAL*8 A(10),END
3      DATA END/' 6END ' /
4      COMMON/INPUT1/AINCIN(18),ANG(18),RF(18),TAUW(18),R2(18),
      1      *      R3(18),R4(18),R5(18),R6(18),R7(18),R8(18),
      2      ALS1(18),ALS2(18),ALA(18),ALB(18),ALE(18),A01(18),
      3      A02(18),A03(18),A04(18),A05(18)
5      COMMON/INPUT3/GEOCON(45,18)
6      COMMON/INPUT4/NGEO(18),APORT(18),TAUPL(50,18),ALPPL(50,18),
      1      AKGYP(50,18),TAUHD(50),ABHD(50),PMOHD(50),
      2      RMOHD(50),XCGHD(50),TAUN(50),ABN(50),PMOIN(50),
      3      RMOIN(50),XCGN(50),NGEOHD,NGEOMN
      COMMON/INPUTL/PRTFLG,NWRTAB,NPUTAB
      COMMON/INPUT0/KPLANE,K4OICG
9      COMMON/WORKRH/RH1(5),HH2,ACG,HHW,VFHO,VCH,ANK(10)
10     COMMON/WORKRN/RN1(8),VFNO,VGN,ACK(10)
11     COMMON/PARAMB/ HSUBMG,NSJBMG,NEND,ASEA,ASEB,SUMDVA,SUMDVH
12     COMMON/PARAMO/ PMOINA(50),PMOINH(50),RMOINA(50),RMOINH(50),
      1      XCGNA(50),XCGNB(50),ABNA(50),ABNB(50)
13     NIBOUT=20
14     IF(NPUTAB.EQ.0) GO TO 220
      C      PUNCH REFERENCE PLANE GEOMETRY CONSTANTS
      C      IF(NPUTAB.EQ.1) GO TO 5
15     REWIND NIBOUT
16     1 READ(NIBOUT,3,END=800) (A(I),I=1,10)
17     3 FORMAT(10A8)
18     IF(A(1).EQ.END) GO TO 4
19     GO TO 1
20     4 NUNIT=NIBOUT
21     BACKSPACE NIBOUT
22     GO TO 8
23     5 NUNIT=7
24     8 CONTINUE
25     DO 20 I=1,KPLANE
26     20 WRITE(NUNIT,30)I,(GEOCON(J,I),J=1,45)
27     30 FORMAT(1X,'GEOCON(1,*,I2,*)= '/( 6(' ',E11.5,',','))
28     WRITE(NUNIT,40) NGEOHD,NGEOMN
29     40 FORMAT(1X,'NGEOHD=',I5,',',NGEOMN=',I5,',',)
30     WRITE(NUNIT,50) (I,NGEO(I),I=1,18)
31     50 FORMAT(' ',NGEO(' ',I2,')= ',I4,',',)
32     WRITE(NUNIT,60) (APORT(I),I=1,KPLANE)
33     60 FORMAT(1X,'APORT(1)= '/(1X,6(F11.5,',','))
34     WRITE(NUNIT,70) (TAUHD(I),I=1,NGEOHD)
35     70 FORMAT(1X,'TAUHD(1)= '/(1X,6(E11.5,',','))
36     WRITE(NUNIT,80) (ABHD(I),I=1,NGEOHD)
37     80 FORMAT(1X,'ABHD(1)= '/(1X,6(E11.5,',','))
38     WRITE(NUNIT,90) (TAUN(I),I=1,NGEOMN)
39     90 FORMAT(1X,'TAUN(1)= '/(1X,6(E11.5,',','))
40     WRITE(NUNIT,100) (ABN(I),I=1,NGEOMN)
41

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42      100 FORMAT(1X,'ABN(1)='/(1X,6(E11.5,'.'))
43      DO 145 I=1,KPLANE
44          NN=NGEO(I)
45          WRITE(NUNIT,110) I
46      110 FORMAT(1X,'TAUPL(1,'.I2,'.))=')
47          WRITE(NUNIT,115) (TAUPL(J,I),J=1,NN)
48      115 FORMAT( 6(' ',E11.5,'.'))
49          WRITE(NUNIT,120) I
50      120 FORMAT(1X,'ALPPL(1,'.I2,'.))=')
51          WRITE(NUNIT,115) (ALPPL(J,I),J=1,NN)
52          IF(KMOICG.NE.0) GO TO 145
53          WRITE(NUNIT,130) I
54      130 FORMAT(1X,'AKGYP(1,'.I2,'.))=')
55          WRITE(NUNIT,115) (AKGYP(J,I),J=1,NN)
56      145 CONTINUE
57          IF(KMOICG.NE.0) GO TO 220
58          WRITE(NUNIT,160) (PMOIH(I),I=1,NGEOHD)
59      160 FORMAT(1X,'PMOIH(1)='/(1X,6(E11.5,'.'))
60          WRITE(NUNIT,170) (RMOIH(I),I=1,NGEOHD)
61      170 FORMAT(1X,'RMOIH(1)='/(1X,6(E11.5,'.'))
62          WRITE(NUNIT,180) (XCGHD(I),I=1,NGEOHD)
63      180 FORMAT(1X,'XCGHD(1)='/(1X,6(E11.5,'.'))
64          WRITE(NUNIT,190) (PMOIN(I),I=1,NGEOMN)
65      190 FORMAT(1X,'PMOIN(1)='/(1X,6(E11.5,'.'))
66          WRITE(NUNIT,200) (RMOIN(I),I=1,NGEOMN)
67      200 FORMAT(1X,'RMOIN(1)='/(1X,6(E11.5,'.'))
68          WRITE(NUNIT,210) (XCGN(I),I=1,NGEOMN)
69      210 FORMAT(1X,'XCGN(1)='/(1X,6(E11.5,'.'))
70          IF(INPUTAB.EQ.3 .AND. NUNIT.NE.7) GO TO 5
71          IF(INPUTAB.GT.1) WRITE(NUNIT,215) END
72      215 FORMAT(A8)
73      220 IF(NWRTAB.EQ.0) GO TO 740
C      PRINT GEOMETRY TABLES
74      150 FORMAT(1X,1P8E11.4)
75      480 WRITE(6,490)
76      490 FORMAT(1H1,58X,15HGEOMETRY TABLES///)
77          WRITE(6,500)
78      500 FORMAT(1HX,17HFORE-HEAD SECTION//1HX,5HTAUND)
79          WRITE(6,150) (TAUND(I),I=1,NGEOHD)
80          WRITE(6,510)
81      510 FORMAT(1HX,4HABHD)
82          WRITE(6,150) (ABHD(I),I=1,NGEOHD)
83          IF(KMOICG.NE.0) GO TO 560
84      520 WRITE(6,530)
85      530 FORMAT(1HX,6HPMOIHD)
86          WRITE(6,150) (PMOIH(I),I=1,NGEOHD)
87          WRITE(6,540)
88      540 FORMAT(1HX,6HRMOIHD)
89          WRITE(6,150) (RMOIH(I),I=1,NGEOHD)
90          WRITE(6,550)
91      550 FORMAT(1HX,5HXCGHD)
92          WRITE(6,150) (XCGHD(I),I=1,NGEOHD)
93      560 WRITE(6,570)
94      570 FORMAT(1H0,///1HX,16HFT-HEAD SECTION//1HX,4HTAUND)
95          WRITE(6,150) (TAUND(I),I=1,NGEOMN)

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9140
10070
10030
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10220

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I N D E X

SUBROUTINE PCHWRT

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151      800 WRITE(6,810)
152      810 FORMAT('ERROR IN PCHWRT OF IBM MODULE//NO END CARD FOUND IN IN
      1DATA NAMELIST//CONTINUING EXECUTION AND PUNCHING GEOMETRY TABLES
      2')
153      NPUTAB=1
154      GO TO 5
155      END

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3-2137


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1      SUBROUTINE PLVCNS                                     47630
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 47810
C      SUBROUTINE PLVCNS CALCULATES THE GEOMETRY CONSTANTS OF EACH 47830
C      CYLINDRICAL SECTION REFERENCE PLANE (SECTION 5.1.1).      47840
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 47860
2      COMMON/CONSTS/GN0T,PI,PI32,RADIAN
3      COMMON/INPUTA/BTAGE,DH1,BH,AOHM,R16,HHK
4      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3          TM3,TH4,B71M,B72M,B91M,B92M
5      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALB,ALE,AO(5)
6      COMMON/COML/TH0
7      COMMON/COMX/COSA(5),SINA(5),DTAUX,DTAUWX
8      DO 20 I=1,5                                           47890
9          A(I)=AU(I)/RADIAN                                  47900
10         ZAA=A(I)                                          47910
11         SINA(I)=SIN(ZAA)                                  47920
12         COSA(I)=COS(ZAA)                                  47930
13         R1=RF-TAUW-ALS1                                    47940
14         R9=RF-TAUW-ALS2                                    47950
15         TH1=PI/ANO-TH0                                     47960
16         T2M=R2+ALA*SINA(1)/COSA(1)                       47970
17         T4M=T2M+ALB*SINA(2)/COSA(2)                       47980
18         T5M=(T4M+R4)*COSA(2)/COSA(3)-R4                  47990
19         X45=(T5M+R5)*COSA(3)                              48000
20         Y45=R1+R2*(1.-SINA(1))+ALA*COSA(1)+T2M*(SINA(1)-SINA(2)) 48010
          X+ALB*COSA(2)+R4*(SINA(3)-SINA(2))-R5*SINA(3)      48020
          TEM2=(RF-TAUW-R5)**2-(X45*COSA(3)-Y45*SINA(3))**2 48030
21         TEM1=X45*SINA(3)+Y45*COSA(3)                      48040
22         ALC=SQRT(TEM2)-TEM1                                48050
23         IF(ALC)30,50,50                                     48060
24         IF(TEM1**2-TEM2)40,40,50                           48070
25         IF(TEM1**2-TEM2)40,40,50                           48080
26         ALC=0.                                             48090
27         50 X03=(T2M-R3)*(COSA(1)+TAN((A(1)-A(2))/2.)*SINA(1)) 48100
28         Y03=R1+R2+(R3-R2)*SINA(1)+((T2M-R3)*TAN((A(1)-A(2))/2.)+ALA)*COSA(
          X1)                                                 48110
29         R03=SQRT(X03**2+Y03**2)
30         X05=(T5M+R4)*COSA(3)
31         Y05=Y45+(R5-R4)*SINA(3)
32         R05=SQRT(X05**2+Y05**2)
33         X07=X45+ALC*SINA(3)
34         Y07=Y45+ALC*COSA(3)
35         R07=SQRT(X07**2+Y07**2)
36         T6M=T5M+ALC*SINA(3)/COSA(3)                       48190
37         T7M=SQRT(X07**2+(RF-Y07)**2)-R5
38         T12M=R8+ALE*SINA(5)/COSA(5)                       48210
39         X76=(T12M+R6)*COSA(4)                             48220
40         Y76=R9+R8*(1.-SINA(5))+ALE*COSA(5)+T12M*(SINA(5)-SINA(4)) 48230
          X-R6*SINA(4)                                         48240
41         TEM1=X76*SINA(4)+Y76*COSA(4)
42         TEM2=(RF-TAUW-R6)**2-(X76*COSA(4)-Y76*SINA(4))**2 48250
43         ALD=SQRT(TEM2)-TEM1                                48260
44         IF(ALD)60,80,80                                     48270
          60
          80

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45 60 IF (TEM1**2-TEM2) 70,70,80 48290
46 70 ALD=0. 48300
47 80 X09=X76+ALD*SINA(4)
48 Y09=Y76+ALD*COA(4)
49 R09=SQRT(X09**2+Y09**2)
50 X011=(T12M-R7)*(TAN((A(5)-A(4))/2.)*SINA(5)+COA(5)) 48340
51 Y011=R9+R8+(R7-R8)*SINA(5)+((T12M-R7)*TAN((A(5)-A(4)/2.)*ALE)*COA 48350
    X(5)) 48360
52 R011=SQRT(X011**2+Y011**2)
53 T10M=T12M+ALD*SINA(4)/COA(4) 48380
54 T9M=SQRT(X09**2+(RF-Y09)**2)-R6
55 IF (T7M-T9M) 90,100,100 48400
56 90 TAUM=T9M 48410
57 GO TO 110 48420
58 100 TAUM=T7M 48430
59 110 DUM1 = Y07 / R07
60 TH2 = ACOS(DUM1) 48450
61 DUM2 = Y09 / R09
62 TH3 = ACOS(DUM2) 48470
63 TH4=TH1-TH2-TH3 48480
64 TEMP=(T7M+R5)**2-(RF-Y07)**2
65 IF (TEMP) 120,130,130 48500
66 120 TEMP=0. 48510
67 130 DUM3 = SQRT(TEMP) / (T7M + R5) 48520
68 B71M = ACOS(DUM3) - A(3) 48530
69 B72M=PI/2.+TH2-B71M-A(3) 48540
70 TEMP=(T9M+R6)**2-(RF-Y09)**2
71 IF (TEMP) 140,150,150 48560
72 140 TEMP=0. 48570
73 150 DUM4 = SQRT(TEMP) / (T9M + R6) 48580
74 B71M = ACOS(DUM4) - A(4) 48590
75 B92M=PI/2.+TH3-B71M-A(4) 48600
76 IF (TH0) 170,170,160 48610
77 160 ANGAB=ASIN((RF-R5-TAUW)*SIN(TH2)/(T6M+R5)) 48620
78 ANGABC=PI-TH2-ANGAB 48630
79 ANGACB=ASIN((RF-R5-TAUW)*SIN(ANGABC)/RF) 48640
80 ANGABAC=PI-ANGABC-ANGACB 48650
81 ANGAFE=PI/2.-A(1) 48660
82 ANGAFB=PI/2.+A(1) 48670
83 ANGAEF=ASIN((R1+R2)*SIN(ANGAFE)/RF) 48680
84 ANGABE=PI-ANGAFB-ANGAEF 48690
85 IF (TH0.LT.ANGGAE) GO TO 162 48700
86 TAUM=RF-R1 48710
87 GO TO 170 48720
88 162 BH=SQRT(RF**2+(RF-R5-TAUW)**2.-2.*RF*(RF-R5-TAUW)*COS(TH0+TH2)) 48730
89 IF ((TH0+TH2).LT.ANGBAC) GO TO 164 48740
90 ANGAMB=ASIN((RF-R5-TAUW)*SIN(TH0+TH2)/BH) 48750
91 ANGABH=PI-ANGAB-TH0-TH2 48760
92 ANGABC=ANGABAC-ANGABH 48770
93 BHPR=BH*COS(ANGABC) 48780
94 TAUM=AMIN1((RF-R1),(BHPR-R5)) 48790
95 GO TO 170 48800
96 164 TAUM=AMIN1((RF-R1),(BH-R5)) 48810
97 170 WRITE(6,180) 48820
98 180 FORMAT(4H A1,13X,2HA2,13X,2HA3,13X,2HA4,13X,2HA5,13X,

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		X2HR1,13X,2HR9,12X,3HTH1)	48840
99		WRITE(6,190)(A(I),I=1,5),R1,R9,TH1	48850
100	190	FORMAT(7(1PE15.7),1PE14.7)	48860
101		WRITE(6,200)	48870
102	200	FORMAT(5H T24,12X,3HT4M,12X,3HT5M,12X,3HA45,12X,3HY45,12X,	48880
		X2HLC,13X,3HX03,11X,3HY03)	
103		WRITE(6,190)T2M,T4M,T5M,X45,Y45,ALC,X03,Y03	48900
104		WRITE(6,210)	48910
105	210	FORMAT(5H R03,12X,3HX05,12X,3HY05,12X,3HR05,12X,3HX07,12X,	48920
		X3HY07,12X,3HR07,11X,3HT6M)	
106		WRITE(6,190)R03,X05,Y05,R05,X07,Y07,R07,T6M	48940
107		WRITE(6,220)	48950
108	220	FORMAT(5H T7M,12X,4HT12M,11X,3HX76,12X,3HY76,12X,2HLD,11X,	48960
		X3HX09,12X,3HY09,11X,3HR09)	
109		WRITE(6,190)T7M,T12M,X76,Y76,ALD,X09,Y09,R09	48980
110		WRITE(6,230)	48990
111	230	FORMAT(6H X011,11X,4HY011,11X,4HR011,11X,4HT10M,11X,3HT19M,12X,	49000
		X4HTAUM,11X,3HTH2,11X,3HTH3)	49010
112		WRITE(6,190)X011,Y011,R011,T10M,T9M,TAUM,TH2,TH3	49020
113		WRITE(6,240)	49040
114	240	FORMAT(5H T4,12X,4HB71M,11X,4HB72M,11X,4HB91M,11X,4HB92M)	49050
115		WRITE(6,250)H4,B71M,372M,B91M,B92M	49060
116	250	FORMAT(1X,5(1PE15.7),/)	49070
117		RETURN	49080
118		END	

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		THE VARIABLE-		-IS USED BEFORE IT IS DEFINED													
	AORH	-	3C0														
	ASIN	-	77	79	83	90											
	BM	-	3C0	88=	90	93	96										
	BHPK	-	93=	94													
	BTAOL	-	3C0														
	B71M	-	4C0	68=	69	115WR											
	B72M	-	4C0	69=	115WR												
	B91M	-	4C0	74=	75	115WR											
	B92M	-	4C0	75=	115WR												
*	COML	-	6*														
*	COMX	-	7*														
*	CONSTS	-	2*														
	COS	-	12	88	93												
	COSA	-	7C0	12=	16	17	18	19	20	21	22	27	28	30	34		
		-	36	38	39	40	41	42	48	50	51	53					
	UH1	-	3C0														
	UTAUWX	-	7C0														
	UTAUX	-	7C0														
	UUM1	-	59=	60													
	UUM2	-	61=	62													
	UUM3	-	67=	68													
	UUM4	-	73=	74													
	UNOT	-	2C0														
	HHK	-	3C0														
	I	-	800	9	10	11	12	99WR									
*	INPUTA	-	3*														
	PI	-	2C0	15	69	75	78	80	81	92	84	91					
	PI02	-	2C0														
*	PLNCNS	-	1*														
	RADIAN	-	2C0	9													
*	RETURN	-	117*														
	WF	-	5C0	13	14	21	37	42	54	64	70	77	79	81	86		
		-	88	90	94	96											
	W16	-	3C0														
	W011	-	4C0	52=	112WR												
	W03	-	4C0	29=	106WR												
	W05	-	4C0	32=	106WR												
	W07	-	4C0	35=	59	106WR											
	W09	-	4C0	49=	61	109WR											
	W1	-	4C0	13=	20	28	83	86	94	96	99WR						
	W2	-	5C0	16	20	28	83										
	W3	-	5C0	27	28												
	W4	-	5C0	18	20	30	31										
	W5	-	5C0	19	20	21	31	37	64	67	77	79	88	90	94		
		-	96														
	W6	-	5C0	39	40	42	54	70	73								
	W7	-	5C0	50	51												
	W8	-	5C0	38	40	51											
	W9	-	4C0	14=	40	51	99WR										
*	SIN	-	11	77	79	83	90										
	SINA	-	7C0	11=	16	17	20	21	22	27	28	31	33	36	38		
		-	40	41	42	47	50	51	53								
*	SQRT	-	23	29	32	35	37	43	49	52	54	67	73	88			
*	TAN	-	27	28	50	51											

I N D E X

SUBROUTINE PLNCNS

PAGE 303

TAUM	-	4CO	56=	58=	86=	94=	96=	112WR										
TAUW	-	5CO	13	14	21	42	77	79	88	90								
TEMP	-	64=	65	66=	67	70=	71	72=	73									
TEM1	-	22=	23	25	41=	43	45											
TEM2	-	21=	23	25	42=	43	45											
TH0	-	6CO	15	76	85	88	89	90	91									
TH1	-	4CO	15=	63.	99WR													
TH2	-	4CO	60=	63	69	77	78	88	89	90	91	112WR						
TH3	-	4CO	62=	63	75	112WR												
TH4	-	4CO	63=	115WR														
T10M	-	4CO	53=	112WR														
T12M	-	4CO	38=	39	40	50	51	53	109WR									
T2M	-	4CO	16=	17	20	27	28	103WR										
T4M	-	4CO	17=	18	103WR													
T5M	-	4CO	18=	19	30	36	103WR											
T6M	-	4CO	36=	77	106WR													
T7M	-	4CO	37=	55	58	64	67	109WR										
T9M	-	4CO	54=	55	56	70	73	112WR										
WORKA	-	5*																
WORK45	-	4*																
X011	-	4CO	50=	52	112WR													
X03	-	4CO	27=	29	103WR													
X05	-	4CO	30=	32	106WR													
X07	-	4CO	33=	35	37	106WR												
X09	-	4CO	47=	49	54	109WR												
X45	-	4CO	19=	21	22	33	103WR											
X76	-	4CO	39=	41	42	47	109WR											
Y011	-	4CO	51=	52	112WR													
Y03	-	4CO	23=	29	103WR													
Y05	-	4CO	31=	32	106WR													
Y07	-	4CO	34=	35	37	59	64	106WR										
Y09	-	4CO	48=	49	54	51	70	109WR										
Y45	-	4CO	20=	21	22	31	34	103WR										
Y76	-	4CO	40=	41	42	48	109WR											
ZAA	-	10=	11	12														

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3-3774

47		IF (ABS(ALD)-.01)240,240,250	65180
48	240	CONTINUE	65190
49		ALD=0.0	65200
50		GEOCON(29,KPLANE)=ALD	
51		GO TO 270	65230
52	250	WRITE(6,260)	65240
53	260	FORMAT(12HOLD NEGATIVE)	65250
54		IER=1	65260
55	270	IF (H71M)280,320,320	65270
56	280	CONTINUE	65280
57		IF (ABS(H71M)-.01)290,290,300	65290
58	290	CONTINUE	65300
59		H71M=0.0	65310
60		GEOCON(42,KPLANE)=H71M	
61		GO TO 320	65340
62	300	WRITE(6,310)	65350
63	310	FORMAT(14H0871M NEGATIVE)	65360
64		IER=1	65370
65	320	IF (H91M)330,370,370	65380
66	330	CONTINUE	65390
67		IF (ABS(H91M)-.01)340,340,350	
68	340	CONTINUE	
69		H91M=0.0	65420
70		GEOCON(44,KPLANE)=H91M	
71		GO TO 370	65450
72	350	WRITE(6,360)	65460
73	360	FORMAT(14H0891M NEGATIVE)	65470
74		IER=1	65480
75	370	IF (A(2))380,400,400	65490
76	380	WRITE(6,390)	65500
77	390	FORMAT(17H0ALPHA 2 NEGATIVE)	65510
78		IER=1	65520
79	400	IF (H3)410,440,410	65530
80	410	CONTINUE	65540
81		IF (A(1)-A(2))420,440,440	65550
82	420	WRITE(6,430)	65560
83	430	FORMAT(29H0ALPHA 2 GREATER THAN ALPHA 1)	65570
84		IER=1	65580
85	440	IF (H4)450,480,450	65590
86	450	CONTINUE	65600
87		IF (A(3)-A(2))460,480,480	65610
88	460	WRITE(6,470)	65620
89	470	FORMAT(29H0ALPHA 2 GREATER THAN ALPHA 3)	65630
90		IER=1	65640
91	480	IF (A(4))490,510,510	65650
92	490	WRITE(6,500)	65660
93	500	FORMAT(17H0ALPHA 4 NEGATIVE)	65670
94		IER=1	65680
95	510	IF (A(5)-A(4))520,540,540	65690
96	520	WRITE(6,530)	65700
97	530	FORMAT(29H0ALPHA 4 GREATER THAN ALPHA 5)	65710
98		IER=1	65720
99	540	IF (TH4)550,610,610	65730
100	550	CONTINUE	65740
101		IF (ABS(TH4)-.01)560,560,590	65750

102	560	CONTINUE	65760
103		TH4=0.0	65770
104		GECON(41,KPLANE)=TH4	
105		IF (TH3) 570,570,610	65800
106	570	CONTINUE	65810
107		IF (ABS(TH1-TH2)/TH1-.01) 580,580,590	65820
108	580	CONTINUE	65830
109		TH2=TH1	65840
110		GECON(39,KPLANE)=TH2	
111		GO TO 610	65870
112	590	WRITE(6,600)	65880
113	600	FORMAT(17H0THETA 4 NEGATIVE)	65890
114		IER=1	65900
115	610	RETURN	65910
116		END	

SYMBOL	-----	REFERENCES	-----
10	- 7*		
20	- 7 8*		
30	- 8#R 9*		
40	- 7 11*		
50	- 11 12*		
60	- 13 14*		
70	- 13 18*		
80	- 18#R 19*		
90	- 11 17 21*		
100	- 21 22*		
110	- 23 24*		
120	- 23 28*		
130	- 28#R 29*		
140	- 21 27 31*		
150	- 31 32*		
160	- 32#R 33*		
170	- 31 35*		
180	- 35 36*		
190	- 37 38*		
200	- 37 42*		
210	- 42#R 43*		
220	- 35 41 45*		
230	- 45 46*		
240	- 47 48*		
250	- 47 52*		
260	- 52#R 53*		
270	- 45 51 55*		
280	- 55 56*		
290	- 57 58*		
300	- 57 62*		
310	- 62#R 63*		
320	- 55 61 65*		
330	- 65 66*		
340	- 67 68*		
350	- 67 72*		
360	- 72#R 73*		
370	- 65 71 75*		
380	- 75 76*		
390	- 76#R 77*		
400	- 75 79*		
410	- 79 80*		
420	- 81 82*		
430	- 82#R 83*		
440	- 79 81 85*		
450	- 85 86*		
460	- 87 88*		
470	- 88#R 89*		
480	- 85 87 91*		
490	- 91 92*		
500	- 92#R 93*		
510	- 91 95*		
520	- 95 96*		
530	- 96#R 97*		

I N D E X

SUBROUTINE PLNLCS(IER).

PAGE 30A

540	-	95	99*																
550	-	99	100*																
560	-	101	102*																
570	-	105	106*																
580	-	107	108*																
590	-	101	107	112*															
600	-	112**	113*																
610	-	99	105	111	115*														
A	-	400	75	81	87	91	95												
* ABS	-	13	23	37	47	57	67	101	107										
AINC	-	500																	
ALA	-	500																	
ALB	-	500																	
ALC	-	400	35	37	39=	40													
ALD	-	400	45	47	49=	50													
ALE	-	500																	
ALS1	-	500																	
ALS2	-	500																	
ANO	-	500																	
AQ	-	500																	
B71M	-	400	55	57	59=	60													
B72M	-	400																	
B91M	-	400	65	67	69=	70													
B92M	-	400																	
GECON	-	200	16=	26=	40=	50=	60=	70=	104=	110=									
IER	-	1A6	6=	10=	20=	30=	34=	44=	54=	64=	74=	78=	84=	90=					
	-	94=	98=	114=															
* INPUT0	-	3*																	
* INPUT3	-	2*																	
KMOIC6	-	300																	
KPLANE	-	300	16	26	40	50	60	70	104	110									
* PLNLCS	-	1*																	
* RETURN	-	115*																	
KF	-	500																	
K011	-	400																	
K03	-	400																	
K05	-	400																	
K07	-	400																	
K09	-	400																	
K1	-	400	7																
K2	-	500																	
K3	-	500	11	13	15	79													
K4	-	500	85																
K5	-	500																	
K6	-	500																	
K7	-	500	21	23	25														
K8	-	500																	
K9	-	400	31																
TAUM	-	400																	
TAUM	-	500																	
TH1	-	400	107	109															
TH2	-	400	107	109=	110														
TH3	-	400	105																
TH4	-	400	99	101	103=	104													
T10M	-	400																	

3-303

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I N D E X

SUBROUTINE PLNLC5 (IER)

Page 309

	T12M	-	4C0	21	23	25=	26
	T2M	-	4C0	11	13	15=	16
	T4M	-	4C0				
	T5M	-	4C0				
	T6M	-	4C0				
	T7M	-	4C0				
	T9M	-	4C0				
"	WOKKA	-	5*				
"	WOKK45	-	4*				
	X011	-	4C0				
	X03	-	4C0				
	X05	-	4C0				
	X07	-	4C0				
	X09	-	4C0				
	X45	-	4C0				
	X76	-	4C0				
	Y011	-	4C0				
	Y03	-	4C0				
	Y05	-	4C0				
	Y07	-	4C0				
	Y09	-	4C0				
	Y45	-	4C0				
	Y76	-	4C0				

74570
74660
74680
74690
74700
74720

74740
74750
74760
74770
74780
74790
74800
74810
74820

74840

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I N D E X

SUBROUTINE POSUB

PAGE 311

SYMBOL	-----	REFERENCES	-----
AANN	- 3C0		
AIG	- 3C0		
ALITTL	- 3C0		
ALTO	- 2C0		
AO	- 2C0		
AOE	- 3C0	14	
ARCO	- 3C0		
ARC1	- 3C0		
ASII	- 3C0		
ATE	- 3C0		
BO	- 2C0		
BOE	- 3C0	14	
BTAO	- 2C0		
DX	- 3C0		
BIE	- 3C0		
CO	- 2C0		
COS	- 5	11	12
COSGM1	- 2C0	11=	
COSGMP	- 2C0	5=	7
COSTHR	- 2C0	12=	13
DELLKI	- 3C0		
DU	- 2C0		
GAMA1	- 4C0	10	11
GAMA2	- 4C0	5	6
PARMH	- 3C0		
PARMM	- 4C0		
POSUB	- 1C0		
RAT	- 4C0	9	13
RETURN	- 15C0		14
ROE1	- 3C0		
ROPE4	- 3C0		
RXX	- 3C0		
SIN	- 5	8	10
SINGM1	- 2C0	10=	
SINGM2	- 2C0	8=	7
SINIHR	- 2C0	8=	9
SORT	- 14		
TANGM2	- 2C0	7=	
TANPH1	- 2C0		
THR	- 4C0	8	12
THR1	- 3C0		
THRU	- 3C0		
XD	- 2C0	9=	
XOWORK	- 2C0		
XRA1	- 4C0		
X1	- 2C0		
X2	- 2C0		
X3	- 2C0		
YU	- 2C0	14=	
YPI	- 3C0		
Y1	- 2C0		
Y2	- 2C0		
Y3	- 2C0		

ORIGINAL PAGE IS
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J250-10329-A

Z1	-	3C0	
Z0	-	2C0	13=
ZP1	-	3C0	
Z1	-	2C0	
Z1AT	-	4C0	
Z2	-	2C0	
Z3	-	2C0	

ORIGINAL PAGE IS
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44		GO TO (40,50,90),IEX	46910.
45	40	CONTINUE	46920
46	50	LSWIT1 = 2	46930
47		I=13	46940
48	60	KRASUB=I	46960
49		KKASUB=I	46970
50		ALSX=AL(I)	46980
51		IF (ALSX) 70,80,70	46990
52	70	CALL S01013(IEX)	47000
53		GO TO (80,50,90),IEX	47010
54	80	I=I-1	47020
55		IF (I-8) 90,90,60	47030
56	90	IF (TAUW) 290,290,100	47040
57	100	ALL=0.	47050
58		RA=RF-TAUW+TAU	47060
59		IF (RA-RF) 120,110,110	47070
60	110	RA=RF	47080
61	120	CALL HESUB	47090
62		HEI=HE	47100
63		HEIA=HEA	
64		HEIB=HEB	
65		RA0=RA	47110
66		ALL=DELLI	47120
67		IF (ALL-TAUW) 140,140,130	47130
68	130	ALL=TAUW	47140
69	140	RA=RF-TAUW+ALL+TAU	47150
70		IF (RA-RF) 160,150,150	47160
71	150	RA=RF	47170
72	160	GO TO (170,180),KWI2	47180
73	170	TEMP=RA0**4	47190
74		TEMP1=RA**4	47200
75		AJPP=AJPP+(TEMP1-TEMP)*PI/2.	47210
76		WT=WT+(RA**2-RA0**2)*PI	47220
77		AKGY=SQRT(AJPP*ZERODV(WT))	47230
78		GO TO 250.	47240
79	180	CALL HESUB	47250
80		WI=(RA**2-RA0**2)*PI*((HE+HEI)*DELF/2.)	47260
81		AJPP=AJPP+(RA0**2+RA**2)*WI/(2.*GNOT)	
82		IF (NEND.EQ.1.OR.NSUBMG.EQ.0) GO TO 185	
83		WIA = (RA**2 - RA0**2)*PI*((HEA+HEIA)*DELF/2.)	
84		WIB = (RA**2 - RA0**2)*PI*((HEB+HEIB)*DELF/2.)	
85		AJPPA=AJPPA+(RA0**2+RA**2)*WIA/(2.*GNOT)	
86		AJPPB=AJPPB+(RA0**2+RA**2)*WIB/(2.*GNOT)	
87	185	IF (AINCW-HCO) 190,200,190	
88	190	HCG=HCH+(HE+HEI)/4.	47290
89		GO TO 210	47300
90	200	HCG=(HE+HEI)/4.	47310
91	210	TEMP=RA0**2+RA**2	47320
92		TEMP1=HE+HEI	47330
93		TEMP2=(TEMP1**2/12.+TEMP)*WI/(4.*GNOT)	
94		AJBB=AJBB+HCG**2*WI/GNOT +TEMP2	
95		XNANI=((HE+HEI)*WI/4.+WT*XBARI)*ZERODV(WI+WT)	47360
96		IF (NEND.EQ.1.OR.NSUBMG.EQ.0) GO TO 215	
97		HCGA=(HEA+HEIA)/4.	
98		TEMP1=HEA+HEIA	

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99      TEMP2=(TEMP1**2/12.+TEMP)*WIA/(4.*GNOT)
100     AJBBA= AJBBA + RCGA**2*WIA/GNOT + TEMP2
101     XBARIA=((HEA+HEIA)*WIA/4. +WTA*XBARIA)*ZERODV(WTA+WIA)
102     RCGH=(HEB+HEIB)/4.
103     TEMP1=HEB+HEIB
104     TEMP2=(TEMP1**2/12.+TEMP)*WIB/(4.*GNOT)
105     AJBBB= AJBBB + RCGH**2*WIB/GNOT + TEMP2
106     XBARIB=((HEB+HEIB)*WIB/4.+WTB*XBARIB)*ZERODV(WTB+WIB)
107     215 IF (AINCW-HCO) 230,220,230
108     220 XBN=XBARI
109     AJHNOZ=AJBBA
110     AJPNQZ=AJPP
111     GO TO 240
112     230 XBARIH=XBARI
113     XBH=XBARI
114     AJPH=AJPP
115     AJPHQ=AJPP
116     AJHH=AJBB
117     AJHHFD=AJBB
118     240 WT=W1+W1
119     WTA=WIA+WIA
120     WTB=WTB+WIB
121     250 IF (ALL-TAUW) 260,290,290
122     260 ALL=ALL+DELLI
123     IF (ALL-TAUW) 280,280,270
124     270 ALL=TAUW
125     280 KAN=PA
126     HEI=HE
127     HEIA=HEA
128     HEIB=HEB
129     IF (KF-HAU) 290,290,140
130     290 LSWIT1=1
131     RETURN
132     END

```

47410

47430

47440

47450

47460

47470

47480

47490

47500

47510

47520

47530

47540

47550

47560

47570

47580

47590

47610

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I N D E X

SUBROUTINE PT1AA(K)

PAGE 317

AJPPA	-	14C0	25=	85=							
AJPPH	-	14C0	26=	86=							
AK	-	3C0									
AKGY	-	10C0	36=	77=							
AKK	-	3C0									
AKRST	-	10C0									
AL	-	7C0	41	50							
ALA	-	5C0									
ALB	-	5C0									
ALE	-	5C0									
ALITIL	-	11C0									
ALL	-	7C0	57=	66=	67	68=	69	121	122=	123	124=
ALSX	-	9C0	41=	42	50=	51					
ALS1	-	5C0									
ALS2	-	5C0									
AMPN	-	10C0									
AMW	-	10C0									
ANO	-	5C0	20								
AO	-	5C0									
AOE	-	11C0									
ARCO	-	11C0									
ARC1	-	11C0									
ASE	-	7C0									
ASEA	-	12C0									
ASEH	-	12C0									
ASI	-	7C0									
ASII	-	11C0									
AT	-	10C0									
AWEA	-	13C0									
AWEB	-	13C0									
AIE	-	11C0									
BOE	-	11C0									
EX	-	11C0									
GIE	-	11C0									
COMB	-	6*									
COMI	-	7*									
CONSTS	-	2*									
DELFI	-	4C0	80	83	84						
DELM	-	13C0									
DELLI	-	9C0	37=	66	122						
DELLRI	-	11C0									
DELTA	-	10C0									
DELZ	-	4C0									
DIS	-	10C0									
DLRH	-	3C0	37								
DRVHF	-	3C0									
DTINT	-	6C0									
DVA	-	13C0									
DVB	-	13C0									
GNOT	-	2C0	81	85	86	93	94	99	100	104	105
HCO	-	4C0	19	87	107						
HCR	-	9C0	19=	88							
HE	-	7C0	62	80	88	90	92	95	126		
HEA	-	13C0	63	83	97	98	101	127			
HEB	-	13C0	64	84	102	103	106	128			

I N D E X

SUBROUTINE PT1AA(K)

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	HE1	-	800	62=	80	88	90	92	95	126=									
	HE1A	-	1300	63=	83	97	98	101	127=										
	HE1B	-	1300	64=	84	102	103	106	128=										
*	HESUB	-	61*	79*															
	HSUBMG	-	1200																
	I	-	3800	39	40	41	47=	48	49	50	54=	55							
	IEX	-	43AG	44	52AG	53													
*	INPUTC	-	3*																
*	INPUTU	-	4*																
	K	-	1AG	16															
	KDUMP	-	400																
	KHASUB	-	800	39=	48=														
	KWIT1	-	900	17=															
	KWIT2	-	900	18=	72														
	KXKSUB	-	800	40=	49=														
	LSWIT1	-	900	46=	130=														
	NEND	-	1200	82	96														
	NSUBMG	-	1200	82	96														
	P	-	1000																
	PA	-	400																
*	PARMA8	-	12*																
*	PARMA8	-	13*																
*	PARMAE	-	14*																
*	PARMAF	-	15*																
*	PARMD	-	8*																
*	PARME	-	9*																
*	PARMF	-	10*																
*	PARMH	-	11*																
	PH	-	1000																
	PHI	-	400																
	P1	-	200	75	76	80	83	84											
	P102	-	200																
	PON	-	1000																
*	PT1AA	-	1*																
	RA	-	700	58=	59	60=	65	69=	70	71=	74	76	80	81	83				
		-	84	65	86	91	125												
	RADIAN	-	200																
	RA0	-	700	65=	73	76	80	81	83	84	85	86	91	125=	129				
	RC	-	700																
	RC6	-	900	88=	90=	94													
	RC6A	-	97=	100															
	RC6B	-	102=	105															
*	RETURN	-	131*																
	RF	-	500	37	58	59	60	69	70	71	129								
	ROE1	-	1100																
	ROPE4	-	1100																
	RXX	-	1100																
	R2	-	500																
	R3	-	500																
	R4	-	500																
	R5	-	500																
	R6	-	500																
	R7	-	500																
	R8	-	500																
*	SD1013	-	43*	52*															

I N D E X

SUBROUTINE PT1AA(K)

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```

*  SORT      - 77
  SUMDV      - 700
  SUMDVA     - 1200
  SUMDVH     - 1200
  T          - 1000
  TAU        - 700    58    69
  TAUAD      - 600
  TAUW       - 500    54    58    67    68    69    121    123    124
  TEMP       - 73=    75    91=    93    99    104
  TEMP1      - 74=    75    92=    93    98=    99    103=    104
  TEMP2      - 93=    94    99=    100    104=    105
  THR1       - 1100
  THR2       - 1100
  TIME       - 1000
  U          - 1000
  WI         - 700    30=    80=    81    93    94    95    118
  WIA        - 1500    31=    83=    85    99    100    101    119
  WIH        - 1500    32=    84=    86    104    105    106    120
*  WORKA     - 5*
  WI         - 700    33=    76=    77    95    118=
  WIA        - 1500    34=    101    119=
  WID        - 1500    35=    106    120=
  XBAR1      - 800    27=    95=    108    112    113
  XBAR1A     - 1400    28=    101=
  XBAR1B     - 1400    29=    106=
  XBAR1H     - 700    112=
  XBAR1N     - 900
  XBN        - 600    113=
  XBN        - 600    104=
  XR         - 700
  YP1        - 1100
  THE VARIABLE - ZEROOV - IS USED BEFORE IT IS DEFINED
  ZEROOV     - 77    95    101    106
  ZI         - 1100
  ZP1        - 1100

```

```

1      SUBROUTINE PISUB                                     74860
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 74970
C      SUBROUTINE PISUB DETERMINES THE COORDINATES (X1, Y1, AND Z1) OF 74990
C      THE POINT P1 THAT IS LOCATED ON THE Z AXIS ALONG A LINE THROUGH 75000
C      POINT P0 AND NORMAL TO THE SECTOR PERIMETER (SECTION 5.2.1.1.1). 75010
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 75030
2      COMMON/CONSTS/GN0T,PI,P102,RADIAN
3      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T104,T9M,TAUM,TH2,
3          TH3,TH4,B71M,B72H,B91M,B92M
4      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALB,ALE,AW(5)
5      COMMON/XOWORK/X0,Y0,Z0,X2,Y2,Z2,X1,Y1,Z1,X3,Y3,Z3,TANGM2,SINTHR,
1          COSTHR,TANPH1,A0,H0,C0,D0,HTA0,SINGM2,COSGM2,
2          SINGM1,COSGM1,ALTO
6      COMMON/PARMH/B1E,B0E,AANN,HX,RXX,AS11,DELLR1,ROPE4,A1E,YPI,ZP1,
1          ARCO,ARC1,R0E1,ALITTL,ZI,A1G,THRI,THRO,A0F
7      COMMON/PARMH/RAT,XRAT,THR,GAMA1,GAMA2,Z1AT
8      COMMON/PARMH/ALP,KRASB,KXRSBB,KGAM
9      COSGM1=COS(GAMA1)                                     75050
10     SINGM1=SIN(GAMA1)                                     75060
11     IF (THR)20,10,20                                     75070
12     Z1=ROPE4                                             75080
13     GO TO 100                                             75090
14     IF (KRASBB-9)40,30,40                                75100
15     RXX=R5                                               75110
16     BX=B71M                                             75120
17     GO TO 60                                             75130
18     IF (KRASBB-10)70,50,70                               75140
19     50 RXX=R6                                             75150
20     BX=B91M                                             75160
21     IF (ALP/RXX-BX)70,70,110                             75170
22     70 TEMP=THR+GAMA1                                     75180
23     TEMP1=1.565795-TEMP                                  75190
24     IF (TEMP1)80,B0,90                                    75200
25     80 TEMP=1.565795                                     75210
26     90 Z1=Z0+X0*SIN(TEMP)/COS(TEMP)                     75220
27     100 Y1=Y0                                             75230
28     Z1AT=0.                                               75240
29     X1=0.                                                 75290
30     GO TO 120                                             75300
31     110 Z1AT=SQRT((B1E**2-Y0)*A1E**2/B1E**2)            75310
32     GAMA20=1.570795-GAMA1-ACOS(SQRT(1.-(COSGM1*RAT/Z1AT)**2)) 75320
33     Z1=Z1AT*COS(THR-GAMA20)                               75330
34     X1=Z1AT*SIN(THR-GAMA20)                               75340
35     Y1=Y0                                                 75380
36     120 RETURN                                           75390
37     END

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0256-10920-4

ORIGINAL PAGE IS
OF POOR QUALITY

I N D E X

SUBROUTINE PLSUB

PAGE 321

SYMBOL	-----	REFERENCES	-----
10	-- 11	12*	
20	-- 11	14*	
30	-- 14	15*	
40	-- 14	18*	
50	-- 18	19*	
60	-- 17	21*	
70	-- 18	21	22*
80	-- 24	25*	
90	-- 24	26*	
100	-- 13	27*	
110	-- 21	31*	
120	-- 30	36*	
A	-- 300		
AANN	-- 600		
ACUS	THE VARIABLE- ACUS	- IS USED BEFORE IT IS DEFINED	
AIG	-- 32		
AINC	-- 600		
ALA	-- 400		
ALB	-- 400		
ALC	-- 300		
ALD	-- 300		
ALE	-- 400		
ALITIL	-- 600		
ALP	-- 800	21	
ALS1	-- 400		
ALS2	-- 400		
ALTU	-- 500		
AND	-- 400		
AU	-- 500		
A0E	-- 600		
ARCU	-- 600		
ARC1	-- 600		
AS11	-- 600		
AW	-- 400		
A1E	-- 600	31	
B0	-- 500		
B0E	-- 600		
BTA0	-- 500		
BX	-- 600	16=	20= 21
B1E	-- 600	31	
B71M	-- 300	16	
B72M	-- 300		
B91M	-- 300	20	
B92M	-- 300		
CO	-- 500		
CONSTS	-- 2*		
COS	-- 9	26	33
COSGM1	-- 500	9=	32
COSGM2	-- 500		
COSTHR	-- 500		
DELLRI	-- 600		
UO	-- 500		

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I N D E X

SUBROUTINE PISUB

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	GAMA1	-	7CO	9	10	22	32
	GAMA2	-	7CO				
	GAMA20	-	32=	33	34		
	GNOT	-	2CO				
	KGAM	-	8CO				
	KRASBB	-	8CO	14	18		
	KXRSBB	-	8CO				
*	PARMH	-	6*				
*	PARMM	-	7*				
*	PARMO	-	8*				
	PI	-	2CO				
	PI02	-	2CO				
*	PISUB	-	1*				
	RADIAN	-	2CO				
	RAT	-	7CO	32			
*	RETURN	-	36*				
	RF	-	4CO				
	ROE1	-	6CO				
	ROPE4	-	6CO	12			
	RXX	-	6CO	15=	19=	21	
	R011	-	3CO				
	R03	-	3CO				
	R05	-	3CO				
	R07	-	3CO				
	R09	-	3CO				
	R1	-	3CO				
	R2	-	4CO				
	R3	-	4CO				
	R4	-	4CO				
	R5	-	4CO	15			
	R6	-	4CO	19			
	R7	-	4CO				
	R8	-	4CO				
	R9	-	3CO				
*	SIN	-	10	26	34		
	SINGM1	-	5CO	10=			
	SINGM2	-	5CO				
	SINTHR	-	5CO				
*	SQRT	-	31	32			
	TANGM2	-	5CO				
	TANPH1	-	5CO				
	TAUM	-	3CO				
	TAUM	-	4CO				
	TEMP	-	22=	23	25=	26	
	TEMP1	-	23=	24			
	THR	-	7CO	11	22	33	34
	THRI	-	6CO				
	THRU	-	6CO				
	TH1	-	3CO				
	TH2	-	3CO				
	TH3	-	3CO				
	TH4	-	3CO				
	T10M	-	3CO				
	T12M	-	3CO				
	T2M	-	3CO				

INDEX

SUBROUTINE PISUB

PAGE 323

T4M	-	300					
T5M	-	300					
T6M	-	300					
T7M	-	300					
T9M	-	300					
* WDRKA	-	4*					
* WDRK45	-	3*					
X0	-	500	26				
* XOWORKK	-	5*					
ARAT	-	700					
X011	-	300					
X03	-	300					
X05	-	300					
X07	-	300					
X09	-	300					
X1	-	500	29=	34=			
X2	-	500					
X3	-	500					
X4b	-	300					
X76	-	300					
Y0	-	500	27	31	35		
YPI	-	600					
Y011	-	300					
Y03	-	300					
Y05	-	300					
Y07	-	300					
Y09	-	300					
Y1	-	500	27=	35=			
Y2	-	500					
Y3	-	500					
Y4b	-	300					
Y76	-	300					
Z1	-	600					
Z0	-	500	26				
ZP1	-	600					
Z1	-	500	12=	26=	33=		
Z1AT	-	700	28=	31=	32	33	34
Z2	-	500					
Z3	-	500					

.....

0256-10029-4

SYMBOL	-----	REFERENCES	-----
10	- 5 6*		
20	- 5 10*		
30	- 10 11*		
40	- 10 11*		
50	- 12 14*		
60	- 9 22*		
AAA	- 17= 19AG		
AANN	- 3CO		
THE VARIABLE- ACOS -IS USED BEFORE IT IS DEFINED			
ACOS	- 13		
AIG	- 3CO		
ALITL	- 3CO		
ALTO	- 2CO		
AO	- 2CO		
AOE	- 3CO		
ARCU	- 3CO		
ARCL	- 3CO		
AS11	- 3CO		
AlE	- 3CO 17 20		
BBB	- 16= 19AG		
BU	- 2CO		
BOE	- 3CO		
BTAD	- 2CO		
EX	- 3CO		
ElE	- 3CO 17 18 20		
CCC	- 18= 19AG		
CO	- 2CO		
* COS	- 13 14		
COSGM1	- 2CO 11		
COSGM2	- 2CO		
COSTHX	- 2CO		
DELLRI	- 3CO		
DO	- 2CO		
GAMA1	- 4CO 13		
GAMA2	- 4CO 11		
* PARMH	- 3*		
* PARMM	- 4*		
* PHI1	- 11= 13= 14		
* P3SUB	- 1*		
RAT	- 4CO		
* RETURN	- 22*		
ROE1	- 3CO		
ROPE4	- 3CO		
RXX	- 3CO		
* SIN	- 14		
SINGM1	- 2CO		
SINGM2	- 2CO		
SINTHR	- 2CO		
* SQRT	- 13 20		
TANGM2	- 2CO 13		
TANPHI	- 2CO 14= 15 16 17		
* TDORE	- 19*		
THR	- 4CO 10 13		

I N D E X

SUBROUTINE PJ508

PAGE 326

THR1	-	300		
THRO	-	300		
X0	-	200		
* XOWORK	-	20		
XRA1	-	400		
X1	-	200	6	
X2	-	200		
XJ	-	200	6=	21=
YA1	-	15=	16	18
Y0	-	200		
YP1	-	300		
Y1	-	200	7	15
Y2	-	200		
Y3	-	200	7=	20=
Z1	-	300		
Z0	-	200		
ZP1	-	300		
Z1	-	200	8	15
Z1AT	-	400	5	
Z2	-	200		
Z3	-	200	8=	19AG 20

I N D E X

SUBROUTINE PJSUB

PAGE 326

THRI	-	300		
THRO	-	300		
XO	-	200		
XOWORK	-	2*		
XRAI	-	400		
X1	-	200	6	
X2	-	200		
XJ	-	200	6=	21=
YA1	-	15=	16	18
Y0	-	200		
YPI	-	300		
Y1	-	200	7	15
Y2	-	200		
Y3	-	200	7=	20=
Z1	-	300		
Z0	-	200		
ZP1	-	300		
Z1	-	200	8	15
Z1AT	-	400	5	
Z2	-	200		
Z3	-	200	H=	19AG 20

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1      SUBROUTINE RASUB(KRASUB)                                56900
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 57040
C      SUBROUTINE RASUB DETERMINES THE LENGTH OF A RADIUS VECTOR FROM 57060
C      THE MOTOR AXIS TO A POINT ON THE PERIMETER FOR EACH SECTOR IN THE 57070
C      END SECTIONS WITH A STRAIGHT THROUGH WEB (SECTION 5.2.3.2). 57080
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 57100
2      COMMON/CONST/6N0T,PI,P102,RADIAN
3      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1      R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2      ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3      TH3,TH4,B71M,B72M,B91M,B92M
4      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1      ALS1,ALS2,ALA,ALH,ALE,AW(5)
5      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XHAH,H,ASE,AFF,WI,WT,RA,
1      RAO,ALL,AJPP,ASI
6      COMMON/COMX/COSA(5),SINA(5),DTAUX,DTAUW
7      COMMON/PARMC/DEL3,DEL7,B71,B91
C
8      GO TO (10,20,30,40,50,60,70,130,80,90,100,110,120),KRASUB 57110
9      TEMP1=R2-TAU 57120
10     TEMP2=COS(ALL/TEMP1) 57130
11     TEMP3=R1+R2 57140
12     TEMP2=2.*TEMP1*TEMP2*TEMP3 57150
13     RA=SQRT(TEMP1**2+TEMP3**2-TEMP2) 57160
14     GO TO 130 57170
15     20     TEMP1=((TAU-R2)*SINA(1)+R2+R1*(ALA+DEL3-AL(2)+ALL)*COSA(1))*2 57180
16     TEMP2=(T2M-TAU)*COSA(1)-(AL(2)-DEL3-ALL)*SINA(1) 57190
17     RA=SQRT(TEMP2**2+TEMP1) 57200
18     GO TO 130 57210
19     30     TEMP1=ACOS(X03/R03) 57220
20     TEMP2=R3-TAU 57230
21     TEMP1=2.*R03*TEMP2*COS(ALL/TEMP2-TEMP1-A(1)+3.14159) 57240
22     RA=SQRT(R03**2+TEMP2**2-TEMP1) 57250
23     GO TO 130 57260
24     40     TEMP1=((T4M-TAU)*COSA(2)-(AL(4)-ALL)*SINA(2))*2 57270
25     TEMP2=(H5-R4)*SINA(3) 57280
26     TEMP3=(AL(4)-ALL)*COSA(2) 57290
27     TEMP2=(R4+TAU)*SINA(2)+Y45-TEMP3*TEMP2 57300
28     RA=SQRT(TEMP2**2+TEMP1) 57310
29     GO TO 130 57320
30     50     TEMP1=TAU+R4 57330
31     TEMP2=2.*TEMP1*R05*COS(A(3)-(AL(5)-ALL)/TEMP1+ACOS(X05/R05)) 57340
32     RA=SQRT(TEMP1**2+R05**2-TEMP2) 57350
33     GO TO 130 57360
34     60     TEMP1=(ALC-AL(6)+ALL)*COSA(3)+Y45+(H5+TAU)*SINA(3))*2 57370
35     TEMP2=(T6M-TAU)*COSA(3)-(AL(6)-ALL)*SINA(3) 57380
36     RA=SQRT(TEMP2**2+TEMP1) 57390
37     GO TO 130 57400
38     70     TEMP1=TAU+R5 57410
39     TEMP2=2.*R07*TEMP1*COS(ALL/TEMP1-B71-B/2M+3.14159) 57420
40     RA=SQRT(R07**2+TEMP1**2-TEMP2) 57430
41     GO TO 130 57440
42     80     TEMP1=TAU+R6 57450
43     TEMP2=2.*R09*TEMP1*COS(ALL/TEMP1-B91-B92M+PI) 57460
44     RA=SQRT(R09**2+TEMP1**2-TEMP2)

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45		GO TO 130	57490
46	90	TEMP1=((ALD-AL(10)+ALL)*COSA(4)+Y76+(R6+TAU)*SINA(4))*2	57500
47		TEMP2=(T104-TAU)*COSA(4)-(AL(10)-ALL)*SINA(4)	57510
48		RA=SQRT(TEMP2**2+TEMP1)	57520
49		GO TO 130	57530
50	100	TEMP2=ACOS(X011/R011)	
51		TEMP1=R7-TAU	57550
52		TEMP2=2.*R011*TEMP1*COS(ALL/TEMP1-TEMP2-A(5)+PI)	
53		RA=SQRT(R011**2+TEMP1**2-TEMP2)	
54		GO TO 130	57580
55	110	TEMP1=(TAU-R8)*SINA(5)+R8+R9*(ALE+DEL7-AL(12)+ALL)*COSA(5)	57590
56		TEMP2=(T124-TAU)*COSA(5)-(AL(12)-DEL7-ALL)*SINA(5)	57600
57		RA=SQRT(TEMP2**2+TEMP1**2)	57610
58		GO TO 130	57620
59	120	TEMP1=R8-TAU	57630
60		TEMP2=R9+R8	57640
61		TEMP3=2.*TEMP1*TEMP2*COS(ALL/TEMP1)	57650
62		RA=SQRT(TEMP1**2+TEMP2**2-TEMP3)	57660
63	130	RETURN	57670
64		END	

SYMBOL	REFERENCES															
10	-	8	9*													
20	-	8	15*													
30	-	8	19*													
40	-	8	24*													
50	-	8	30*													
60	-	8	34*													
70	-	8	38*													
80	-	8	42*													
90	-	8	46*													
100	-	8	50*													
110	-	8	55*													
120	-	8	59*													
130	-	8	14	18	20	29	33	37	41	45	49	54	58	63*		
A	-	3C0	21	31	52											
	THE VARIABLE- ACOS			-IS USED BEFORE IT IS DEFINED												
ACOS	-	19	31	50												
AFF	-	5C0														
AINC	-	4C0														
AJPP	-	5C0														
AL	-	5C0	15	16	24	26	31	34	35	46	47	55	56			
ALA	-	4C0	15													
ALB	-	4C0														
ALC	-	3C0	34													
ALD	-	3C0	46													
ALE	-	4C0	55													
ALL	-	5C0	10	15	16	21	24	26	31	34	35	39	43	46		
	-	47	52	55	56	61										
ALS1	-	4C0														
ALS2	-	4C0														
AND	-	4C0														
ASE	-	5C0														
ASI	-	5C0														
AW	-	4C0														
B71	-	7C0	34													
B71M	-	3C0														
B72M	-	3C0	39													
B91	-	7C0	43													
B91M	-	3C0														
B92M	-	3C0	43													
COMI	-	5*														
COMX	-	6*														
CONSTS	-	2*														
COS	-	10	21	31	39	43	52	61								
COSA	-	6C0	15	16	24	26	34	35	46	47	55	56				
DEL3	-	7C0	15	16												
DEL7	-	7C0	55	56												
DTAUWX	-	6C0														
DTAUX	-	6C0														
GNOT	-	2C0														
HE	-	5C0														
KRASUB	-	1A6	8													
PARMC	-	7*														
PI	-	2C0	43	52												

THE VARIABLE - ACOS

- IS USED BEFORE IT IS DEFINED

I N D E X

SUBROUTINE RASUM(KRASJR)

PAGE 330

PI02	1=	2C0												
RA	-	5C0	13=	17=	22=	2H=	32=	36=	40=	44=	48=	53=	57=	62=
RADIAN	-	2C0												
RA0	-	5C0												
RASUM	-	1*												
RC	-	5C0												
RETURN	-	63*												
RF	-	4C0												
R011	-	3C0	50	52	53									
R03	-	3C0	19	21	22									
R05	-	3C0	31	32										
R07	-	3C0	39	40										
R09	-	3C0	43	44										
R1	-	3C0	11	15										
R2	-	4C0	9	11	15									
R3	-	4C0	20											
R4	-	4C0	25	27	30									
R5	-	4C0	25	34	38									
R6	-	4C0	42	46										
R7	-	4C0	51											
R8	-	4C0	55	59	60									
R9	-	3C0	55	60										
SINA	-	6C0	15	16	24	25	27	34	35	46	47	55	56	
SORT	-	13	17	22	28	32	36	40	44	48	53	57	62	
SUMDV	-	5C0												
TAU	-	5C0	9	15	16	20	24	27	30	34	35	39	42	45
TAUM	-	3C0	47	51	55	56	59							
TAUM	-	4C0												
TEMP1	-	9=	10	12	13	15=	17	19=	21=	22	24=	28	30=	31
		32	34=	36	38=	39	40	42=	43	44	46=	48	51=	52
TEMP2	-	53	55=	57	59=	51	62							
		10=	12=	13	16=	17	20=	21	22	25=	27=	28	31=	32
		35=	36	39=	40	43=	44	47=	48	50=	52=	53	55=	57
		60=	61	62										
TEMP3	-	11=	12	13	26=	27	61=	62						
TH1	-	3C0												
TH2	-	3C0												
TH3	-	3C0												
TH4	-	3C0												
T10M	-	3C0	47											
T12M	-	3C0	56											
T2M	-	3C0	16											
T4M	-	3C0	24											
T5M	-	3C0												
T6M	-	3C0	35											
T7M	-	3C0												
T9M	-	3C0												
WI	-	5C0												
WORKA	-	4*												
WORK45	-	3*												
WT	-	5C0												
XBAR1H	-	5C0												
XR	-	5C0												
X011	-	3C0	50											

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SUBROUTINE RASUB(KRASUB)

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X03	-	300	19	
X05	-	300	31	
X07	-	300		
X09	-	300		
X45	-	300		
X76	-	300		
Y011	-	300		
Y03	-	300		
Y05	-	300		
Y07	-	300		
Y09	-	300		
Y45	-	300	27	34
Y76	-	300	46	

0250-19920-4

```

1      SUBROUTINE RASUBH                                75790
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 75910
C      SUBROUTINE RASUBH DETERMINES THE LENGTH OF A RADIUS VECTOR FROM 75930
C      THE MOTOR AXIS TO A GENERAL POINT IN A SECTOR FOR THE BLOC< 1 75940
C      ANALYSIS OF THE HEAD END WITH WEB (SECTION 5.2.1.1.1). 75950
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 75970
2      COMMON/CONSTS/6*DT,P1,P102,RADIAN
3      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2,
3          TH3,TH4,B71M,B72M,B91M,B92M
4      COMMON/WORKA/AINC,ANG,RF,TAUM,R2,R3,R4,R5,R6,R7,R8,
1          A1S1,ALS2,ALA,ALH,ALF,AW(5)
5      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XRAN[H,ASE,AFF,WJ,WT,RA,
1          AAO,ALL,AJPP,ASI
6      COMMON/COMX/C7SA(5),SINA(5),DTAUX,DTAUNX
7      COMMON/PARAMM/XA1,XRAT,THR,GAMA1,GAMA2,Z1A1
8      COMMON/PAR40/ALP,KRASHB,XRSHH,KGAM
C
9      GO TO (10,30,40,50,60,80,90,110,120,140,160,180,190,200,220,230 ), 75980
XRASHH 75990
10      IF (R2) 20,250,20 76000
11      20  TEMP1=COS(ALP/R2) 76010
12          TEMP1=TEMP1**2.*R2*(R1+R2) 76020
13          RAT=SQRT((R1+R2)**2+R2**2-TEMP1) 76030
14          GO TO 250 76040
15      30  TEMP=1.5/0795-A(1) 76050
16          TEMP1=SIN(TEMP) 76060
17          TEMP3=ALP*COSA(1)+R1+R2-R2*COS(TEMP) 76070
18          RAT=SQRT((TEMP1*R2+ALP*SINA(1))**2+TEMP3**2) 76080
19          GO TO 250 76090
20      40  TEMP1=(ALA+ALP)*COSA(1)-R2*SINA(1)+R2+R1 76100
21          TEMP2=(ALA+ALP)*SINA(1)+R2*COSA(1) 76110
22          GO TO 170 76120
23      50  TEMP1=(ALA-T2M*COSA(1)*SINA(2))/COSA(1)+R1+R2-ALP*COSA(2) 76130
24          TEMP2=T2M*COSA(2)-ALP*SINA(2) 76140
25          GO TO 170 76150
26      60  IF (R3) 70,250,70 76160
27      70  TEMP1=2.*R03**23*COS(ALP/R3+3.14159-A(1)-ACOS(X03/R03)) 76170
28          RAT=SQRT(R03**2+R3**2-TEMP1) 76180
29          GO TO 250 76190
30      80  TEMP1=ALP*COSA(2)+R1+R2-(T2M*SINA(2)*COSA(1)-ALA)/COSA(1) 76200
31          TEMP2=ALP*SINA(2)+COSA(2)*T2M 76210
32          GO TO 170 76220
33      90  IF (R4) 100,250,100 76230
34      100 TEMP1=ACOS(SQRT(R05**2-Y05**2)/R05) 76240
35          TEMP1=2.*R4*R05*COS((A(3)*R4-AL(5)+ALP)/R4+TEMP1) 76250
36          RAT=SQRT(R4**2+R05**2-TEMP1)
37          GO TO 250 76260
38      110 TEMP1=R5*SINA(3)+Y45+ALP*COSA(3) 76270
39          TEMP2=T6M*COSA(3)-(ALC-ALP)*SINA(3) 76280
40          RAT=SQRT(TEMP1**2+TEMP2**2) 76290
41          GO TO 250 76300
42      120 IF (R5) 130,250,130 76310
43      130 TEMP1=2.*R07*R5*COS(3.14159-B72M-(B71M*R5-ALP)/R5) 76320

```

44		KAT=SQRT(R07**2+R5**2-TEMP1)	
45		GO TO 250	76360
46	140	IF (R6) 150,250,150	76370
47	150	TEMP1=2.*R09*R6*COS(3.14159-B92M-(B91M*R6-ALP)/R6)	
48		KAT=SQRT(R09**2+R6**2-TEMP1)	
49		GO TO 250	76400
50	160	TEMP1=ALP*COSA(4)+R8+R9-(T12M*SINA(4)*COSA(5)-ALE)/COSA(5)	76410
51		TEMP2=T12M*COSA(4)+ALP*SINA(4)	76420
52	170	KAT=SQRT(TEMP1**2+TEMP2**2)	76430
53		GO TO 250	76440
54	180	TEMP1=(ALE+ALP1*COSA(5)+R9+R8-R8*SINA(5)	76450
55		TEMP2=R8*COSA(5)+(ALE+ALP1)*SINA(5)	76460
56		GO TO 170	76470
57	190	TEMP1=R8+R9-ALP*COSA(4)-(T12M*SINA(4)*COSA(5)-ALE)/COSA(5)	76480
58		TEMP2=T12M*COSA(4)-ALP*SINA(4)	76490
59		GO TO 170	76500
60	200	IF (R7) 210,250,210	76510
61	210	TEMP1=2.*R011*R7*COS((3.14159-A(5))*R7+ALP)/R7-ACOS(X01)/R011)	76520
62		KAT=SQRT(R011**2+R7**2-TEMP1)	
63		GO TO 250	76540
64	220	TEMP1=ALP*COSA(5)+R8+R9-R8*COS(1.570795-A(5))	76550
65		TEMP2=ALP*SINA(5)+R8*SINA(1.570795-A(5))	76560
66		GO TO 170	76570
67	230	IF (R8) 240,250,240	76580
68	240	TEMP1=2.*R8*COS(ALP/R8)*(R9+R8)	76590
69		KAT=SQRT(R8**2+(R9+R8)**2-TEMP1)	76600
70	250	RETURN	76610
71		END	

SYMBOL	-----	REFERENCES	-----
10	- 9	10*	
20	- 10	11*	
30	- 9	15*	
40	- 9	20*	
50	- 9	23*	
60	- 9	26*	
70	- 26	27*	
80	- 9	30*	
90	- 9	33*	
100	- 33	34*	
110	- 9	38*	
120	- 9	42*	
130	- 42	43*	
140	- 9	46*	
150	- 46	47*	
160	- 9	50*	
170	- 22	25	32 52* 56 59 66
180	- 9	54*	
190	- 9	57*	
200	- 9	60*	
210	- 60	61*	
220	- 9	64*	
230	- 9	67*	
240	- 67	68*	
250	- 10	14	19 26 29 33 37 41 42 45 46 49 53
	- 60	63	67 70*
A	- 3C0	15	27 35 61 64 65
	THE VARIABLE- ACUS		- IS USED BEFORE IT IS DEFINED
ACOS	- 27	34	61
AFF	- 5C0		
AINC	- 4C0		
AJPP	- 5C0		
AL	- 5C0	35	
ALA	- 4C0	20	21 23 30
ALB	- 4C0		
ALC	- 3C0	39	
ALD	- 3C0		
ALE	- 4C0	50	54 55 57
ALL	- 5C0		
ALP	- 8C0	11	17 18 20 21 23 24 27 30 31 35 38
	- 39	43	47 50 51 54 55 57 58 61 64 65 68
ALS1	- 4C0		
ALS2	- 4C0		
AND	- 4C0		
ASE	- 5C0		
ASI	- 5C0		
AW	- 4C0		
B71M	- 3C0	43	
B72M	- 3C0	43	
B91M	- 3C0	47	
B92M	- 3C0	47	
* COMT	- 5*		
* COMX	- 6*		

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#	CONSTS	-	2#													
#	COS	-	11	17	27	35	43	47	61	64	68					
	COSA	-	600	17	20	21	23	24	30	31	38	79	50	51	54	
			55	57	58	64										
	DTAUXW	-	600													
	DTAUX	-	600													
	GAMA1	-	700													
	GAMA2	-	700													
	GNOT	-	200													
	HE	-	500													
	KGAH	-	800													
	KRASBB	-	800	9												
	KXRSBB	-	800													
#	PARMM	-	7#													
#	PARMO	-	8#													
	P1	-	200													
	P102	-	200													
	RA	-	500													
	RAU1AN	-	200													
	RAU	-	500													
#	RASUWB	-	1#													
	RAT	-	700	13=	18=	28=	36=	40=	44=	48=	52=	62=	69=			
	RC	-	500													
#	RETUKN	-	70#													
	RF	-	400													
	R011	-	300	61	62											
	R03	-	300	27	28											
	R05	-	300	34	35	36										
	R07	-	300	43	44											
	R09	-	300	47	48											
	R1	-	300	12	13	17	20	23	30							
	R2	-	400	10	11	12	13	17	18	20	21	23	30			
	R3	-	400	26	27	28										
	R4	-	400	33	35	36										
	R5	-	400	38	42	43	44		8							
	R6	-	400	46	47	48										
	R7	-	400	60	61	62										
	R8	-	400	50	54	55	57	64	66	67	68	69				
	R9	-	300	50	54	57	64	6								
#	SIN	-	16	65												
	SINA	-	600	18	20	21	23	24	30	31	38	79	50	51	54	
			55	57	58	65										
#	SORT	-	13	14	28	34	36	40	44	48	52	62	69			
	SUMDV	-	500													
	TAU	-	500													
	TAU4	-	300													
	TAUw	-	400													
	TEMP	-	15=	16	17											
	TEMP1	-	11=	12=	13	16=	18	20=	23=	27=	28	30=	34=	35=	36	
			38=	40	43=	44	47=	48	50=	52	54=	57=	61=	62	64=	
			68=	69												
	TEMP2	-	21=	24=	31=	39=	40	51=	52	55=	58=	65=				
	TEMP3	-	17=	18												
	THR	-	700													
	TH1	-	300													

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SUBROUTINE HASUBB

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IH3	-	300				
IH4	-	300				
I10M	-	300				
I12M	-	300	90	91	97	98
I2M	-	300	23	24	30	31
I4M	-	300				
I5M	-	300				
I6M	-	300	39			
I7M	-	300				
I9M	-	300				
WI	-	500				
* WORKA	-	4*				
* WORK45	-	3*				
WI	-	500				
XBAKIH	-	500				
XR	-	500				
XRA7	-	700				
X011	-	300	61			
X03	-	300	27			
X05	-	300				
X07	-	300				
X09	-	300				
X45	-	300				
X76	-	300				
Y011	-	300				
Y03	-	300				
Y05	-	300	34			
Y07	-	300				
Y09	-	300				
Y45	-	300	38			
Y76	-	300				
Z1A7	-	700				

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1      SUBROUTINE RBSTSB
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      SUBROUTINE RBSTSB DETERMINES THE INITIAL ESTIMATE OF THE BURN RATE
C      COEFFICIENT, AKRST, FOR EACH TIME INCREMENT DURING THE START
C      TRANSIENT INTERVAL AND PERFORMS THE TABLE LOOK-UPS FOR PH AND
C      AKRST (SECTION 4.3.3).
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
2      LOGICAL LIST1,STATIC
3      COMMON/BLK005/ NLEWIS,NST,NF,NRECON,NCASES,NDISP
4      COMMON/BLK021/ TSREC,TEREC,CSBAR,PNSEAR,TWEN,PITW,CSCOE(3),LIST1,RECON
5      $ STATIC
6      COMMON/BLK023/ DATA(10),NWRDS,NUNIT
7      COMMON/CONSTS/GNOT,PI,PI02,RADIAN
8      COMMON/INPUT0/ AKRH,AKRV,RHFLAG
9      COMMON/INPUT0/ AKG(5),AKU(5),AKR(39),AKSLOT(2),NAKR,TIMAKR(25),
10     1 TBLAKR(25),NAKENI
11     1 COMMON/INPUT0/ NPH,PHST(70),TIMEPH(70),NAKRST,TAUAKR(30),
12     1 AKRTAU(30),NTAUTO,PC1AB
13     1 COMMON/INPUT0/ CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
14     1 AMG(20),TCOM(20),NCSCOE
15     1 COMMON/INPUT0/ STFLAG,STDYST,DELTST,DELTSS,DFLTTO
16     1 COMMON/INPUT0/ AITST,PS1,IST,TIMPT1,TIMPT2,DELTSP,ANITW
17     1 COMMON/INPUT0/ DELF,PA,PHI,HCO,DELZ,KDUMP(72)
18     1 COMMON/WORKRN/RN1(5),H12,ACG,HHW,VFH0,VCH,ANK(10)
19     1 COMMON/WORKRN/RN(8),VFND,VCH,ACK(10)
20     1 COMMON/DUMYL/TIMCK2
21     1 COMMON/COMA/DELT,APHI,wDOTI,ANIHO,TIMEW,UT,ANLOPS,ACCEL,
22     1 ABCYL,PRNT(101,15),AJNCHI,AMACH,/CALC(101)
23     1 COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RBZTO(101),PD(101),
24     1 TAUWDP(101),RB,VF,DWDOT,VP
25     1 COMMON/COMS/TPH,AKRADJ,IEND
26     1 COMMON/PARM0/AP,PHIN,PHAX,wDOT,I1I,I1J,wDOTD,NSLOT,NTABE,NTME,
27     1 TAU0,TOFLAG,NINCPL,BRNDUT,IIS,IS1,IS2,NI,SCUR(1A,2)
28     1 COMMON/PARMF/PH,TIME,AJNCW,T,P,DELTA,U,AKUY,PON,DIS,AMPN,AT,
29     1 AMW,AKRST
30     1 COMMON/PARHG/VFH,AAW,VFN,VIS,AIT,SPHDT,SPONDT,VFINI,VFH,ARTOT
31     1 COMMON/PARMS/ICHN
32     1 COMMON/PARMAA/TO,IFLAG
33     1 IF (TIME.EQ.0.0) TIMCK2=0.0
34     1 IF (TIMCK2.GT.TIME) TIMCK2=TIME
35     1 IF (NRECON.GT.0 .AND. NPH.EQ.0) GO TO 130
36     1 IF (NPH) 210,210.10
37     10 IF (TIME-TIMEPH(NPH)) 20,20,210
38     20 IF (TIMCK2-TIME) 30,300,300
39     30 CALL XLIN(TIMEPH,PHST,NPH,TIME,PH,13)
40     80 IF (STDYST-1.0) 90,210,210
41     90 CONTINUE
42     100 DO 110 I=1,NPH
43     110 IF (TIMEPH(I)-TIME) 110,120,120
44     110 CONTINUE
45     120 I=-1
46     130 DPHDT = (PH-PHST(I))/(TIME-TIMEPH(I))
47     140 GO TO 140
48     130 PHZ = PH
49     140 CALL GETDAT(TIME)

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ORIGINAL PAGE IS
OF POOR QUALITY

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42      CALL BIAS
43      PH=DATA(2)
44      DPHOT = (PH-PH2)/DELT
45      140 VOLUME= VP*VCH-VFH+VCN-VFN
46          IF(NCSTR)160,160,150
47      150 CALL XLIN(PRESS,CSTR,NCSTR,PON,CSTAR,14)
48          CALL XLIN(PRESS,TCOMB,NCSTR,PH,TO,15)
49          CALL XLIN(PRESS,GAMAG,NCSTR,PH,GAMA,16)
50          CALL XLIN(PRESS,AMWG,NCSTR,PH,AMW,17)
51      160 IF(CSCOE(1).NE.0.0)CSTAR=CSCOE(1)+CSCOE(2)*PON+CSCOE(3)*PON**2
52          R=1545.864/AMW
53          GAMASQ=GAMA*(2./(GAMA+1.))*((GAMA+1.)/(GAMA-1.))
54          RB=(DPHOT+GAMASQ*CSTAR**2.*AT*TPR*PH/VOLUME)/(GAMASQ*CSTAR**2.
          X*DELF*12.*ABTOT/(VOLUME*GNOT))
55          AKRST=RB/PH**AKR(3)
56      210 IF(NAKRST)240,240,230
57      220 CONTINUE
58          IF(TIME=DELST-TST)230,230,260
59      230 CONTINUE
60          CALL XLIN(TAUAKR,AKRTAJ,NAKRST,TAUZ(NINCP),AKRST,18)
61          GO TO 260
62      240 IF(NPH)250,250,260
63      250 CONTINUE
64          AKRST=AKR(36)
65      260 TIMCK2=TIME
66          IF(TIME)280,270,280
67      270 CONTINUE
68          GO TO 300
69      280 IF(NFLAG)300,300,290
70      290 CONTINUE
71          AKR(2)=AKRST
72          AKR(36)=AKRST
73      300 RETURN
74          . END

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39480

39490

39500

SYMBOL	-----	REFERENCES	-----
10	" 28	29*	
20	" 29	30*	
30	" 30	31*	
80	" 32*		
90	" 32	33*	
100	" 34*		
110	" 3400	35	36*
120	" 35	37*	
130	" 27	40*	
140	" 39	45*	
150	" 45	47*	
160	" 46	51*	
210	" 28	29	32 56*
220	" 56	57*	
230	" 58	59*	
240	" 56	62*	
250	" 62	63*	
260	" 58	61	62 65*
270	" 66	67*	
280	" 66	69*	
290	" 69	70*	
300	" 30	68	69 73*
AAN	" 2200		
ABCYL	" 1700		
ABTOT	" 2200	54	
ACCEL	" 1700		
ACG	" 1400		
ACK	" 1500		
AINCHI	" 1700		
AINCW	" 2100		
AII	" 2200		
AITST	" 1200		
AKG	" 800		
AKGY	" 2100		
AKR	" 800	55 64 71= 72=	
AKRADJ	" 1900		
AKRH	" 700		
AKRN	" 700		
AKRST	" 2100	55= 60AG 64= 71 72	
AKRTAU	" 900	60AG	
AKSLUT	" 800		
AKU	" 800		
AMACH	" 1700		
AMPN	" 2100		
AMW	" 2100	50AG 52	
AMWG	" 1000	50AG	
ANIBO	" 1700		
ANITW	" 1200		
ANK	" 1400		
ANLOPS	" 1700		
AP	" 2000		
APHI	" 1700		
AT	" 2100	54	

I N D E X

SUBROUTINE RBSTSA

PAGE 340

* BIAS	-	42*			
* BLK005	-	3*			
* BLK021	-	4*			
* BLK023	-	5*			
* BRNOUT	-	20CD			
* COMA	-	17*			
* COMG	-	18*			
* COMS	-	19*			
* CONSTS	-	6*			
* CSBAR	-	4CD			
* CSCDEF	-	4CD	51		
* CSTAR	-	10CD	47AG	51=	54
* CSTR	-	10CD	47AG		
* DATA	-	5CD	43		
* DELF	-	13CD	54		
* DELT	-	17CD	44		
* DELTA	-	21CD			
* DELTSP	-	12CD			
* DELTSS	-	11CD			
* DELTST	-	11CD	5A		
* DELTTO	-	11CD			
* DELZ	-	13CD			
* DIS	-	21CD			
* DPHUT	-	38=	44=	54	
* DUMYL	-	18*			
* DWOUT	-	18CD			
* GAMA	-	10CD	49AG	53	
* GAMAG	-	10CD	49AG		
* GAMASQ	-	53=	54		
* GETDAT	-	41*			
* GNOT	-	6CD	54		
* HCO	-	13CD			
* HHW	-	14CD			
* HHZ	-	14CD			
* I	-	34CD	35	37=	38
* ICHN	-	23CD			
* IEND	-	19CD			
* IFLAG	-	24CD			
* III	-	20CD			
* IIJ	-	20CD			
* IIS	-	20CD			
* INPUTD	-	7*			
* INPUTE	-	8*			
* INPUTF	-	9*			
* INPUTG	-	10*			
* INPUTH	-	11*			
* INPUTN	-	12*			
* INPUTU	-	13*			
* IS1	-	20CD			
* IS2	-	20CD			
* KDUMP	-	13CD			
* LIST1	-	2LG	4CD		
* NAKEND	-	8CD			
* NAKR	-	8CD			
* NAKHST	-	9CD	56	60AG	

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I N D E X

SUBROUTINE RBSTSB

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NCASES	-	300																		
NCSCOE	-	1000																		
NCSTR	-	1000	46	47AG	48AG	49AG	50AG													
NDISP	-	300																		
NF	-	300																		
NI	-	2000																		
NINCPL	-	2000	60AG																	
NLEWIS	-	300																		
NPH	-	900	27	28	29	31AG	3400	62												
NRECON	-	300	27																	
NSI	-	300																		
NSLOT	-	2000																		
NTABE	-	2000																		
NTAUTO	-	900																		
NIME	-	2000																		
NUNIT	-	500																		
NWRDS	-	500																		
P	-	2100																		
PA	-	1300																		
* PARMAA	-	24*																		
* PARMB	-	20*																		
* PARMF	-	21*																		
* PARMG	-	22*																		
* PARMS	-	23*																		
PCTAB	-	900																		
PD	-	1800																		
PH	-	2100	31AG	38	40	43=	44	48AG	49AG	50AG	54	55								
PHI	-	1300																		
PHST	-	900	31AG	38																
PHZ	-	40=	44																	
PI	-	600																		
PIO2	-	600																		
PITW	-	400																		
PMAX	-	2000																		
PMIN	-	2000																		
PNSMAR	-	400																		
PON	-	2100	47AG	51																
PRESS	-	1000	47AG	48AG	49AG	50AG														
PRNT	-	1700																		
PST	-	1200																		
R	-	1000	52=																	
RADIAN	-	600																		
RB	-	1800	54=	55																
RBFLAG	-	700	69																	
* RBSTSB	-	1*																		
* RBZ	-	1800																		
* RBZTO	-	1800																		
* RETURN	-	73*																		
RHI	-	1400																		
RNI	-	1500																		
SCUR	-	2000																		
SPHDI	-	2200																		
SPONDI	-	2200																		
STATIC	-	2LG	400																	
STDYST	-	1100	32																	

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[illegible]

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```

44      IF (CKTIME-TIME) 140,150,140      40030
45      140  CKTIME=TIME                    40040
46          NTME=NTME+1                    40050
47      150  AKRTAU(NTME)=AKRST             40060
48          TAUAKR(NTME)=TAUZ(III)         40070
49          GO TO 210                      40080
50      160  NTEST4=1                      40090
51          IF (NTME) 180,180,170          40100
52      170  N = NTME                      40110
53      180  IF (NAKRST) 210,210,190        40120
54      190  N = NAKRST                    40130
55      210  IF (P-PA) 220,220,230          40140
56      220  RB=0.                         40160
57          GO TO 640                      40170
58      230  IF (SLIFLG) 270,270,240        40180
59      240  IF (P-PA) 250,250,260          40190
60      250  HBSLOT=0.0                    40200
61          GO TO 640                      40210
62      260  HBSLOT=AKSLUT(1)*P**AKSLOT(2)  40220
63          GO TO 640                      40230
64      270  IF (IEND-1) 276,272,274
65      272  IF (NAKEND.EQ.1 .OR. NAKEND.EQ.3) GO TO 276
66      273  AKR2=AKR(2)
67          AKR4=AKR(4)
68          AKR38=AKR(38)
69          GO TO 278
70      274  IF (NAKEND.EQ.2 .OR. NAKEND.EQ.3) GO TO 276
71          GO TO 273
72      276  AKR2=AKR(2)*(1.+AKRADJ)
73          AKR4=AKR(4)*(1.+AKRADJ)
74          AKR38=AKR(38)*(1.+AKRADJ)
75      278  CONTINUE
76          GCR=AKG(1)+AKG(2)*P**AKG(3)+AKG(4)*P**AKG(5)  40240
77          UCR=AKU(1)+AKU(2)*P**AKU(3)+AKU(4)*P**AKU(5)  40250
78          G=12.*DELTA*U                  40260
79          IF (TAUTO) 320,320,280          40270
80      280  IF (TOFLAG-1.0) 320,290,320    40280
81      290  TAUOW=HSLVR-TAUZ(III)          40290
82          TAUOW=AMIN1(TAUOW,TAUTO)        40300
83          IF (TAUOW) 300,300,310          40310
84      300  TAUOW=0.0                      40320
85      310  CALL XLIN(TAUAKR,AKRTAU,N,TAUOW,AKRTO,19)
86          AKRTMP=AKRTO                    40340
87      320  CONTINUE                      40350
88          IF (STDYST.GT.0.0.AND.TOFLAG.LT.1.0) AKRTMP=AKR2  40360
89          IF (GCR-6) 330,330,340          40370
90      330  IF (UCR-U) 350,350,340          40380
91      340  RB=AKR(35)+AKRTMP*P**AKR(37)+AKR38 *P**AKR(39)  40390
92          GO TO 640                      40400
93      350  RB=AKR(1)+AKRTMP*P**AKR(3)+AKR4 *P**AKR(5)      40410
94          IF (U) 360,370,360              40420
95      360  RB=RB+AKR(6)*U**AKR(7)+AKR(8)*U**AKR(9)+AKR(14)*U**AKR(15)+U**AKR(
40430
          X16)+AKR(17)*P**AKR(18)+U**AKR(19)
96          GO TO 450                      40440
97      370  IF (AKR(7)) 390,380,390        40450

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98      380      RB=RB+AKR(6)                                40470
99      390      IF (AKR(9)) 410,400,410                    40480
100     400      RB=RB+AKR(8)                                40490
101     410      IF (AKR(16)) 430,420,430                    40500
102     420      RB=RB+AKR(14)*P**AKR(15)                    40510
103     430      IF (AKR(19)) 450,440,450                    40520
104     440      RB=RB+AKR(17)*P**AKR(18)                    40530
105     450      IF (G) 460,470,460                          40540
106     460      RB=RB+AKR(10)*G**AKR(11)+AKR(12)*G**AKR(13)+AKR(20)*P**AKR(21)*G**
      XAKR(22)+AKR(23)*P**AKR(24)*G**AKR(25)                40550
107      GO TO 550                                           40560
108     470      IF (AKR(11)) 490,480,490                    40570
109     480      RH=RB+AKR(10)                                40580
110     490      IF (AKR(13)) 510,500,510                    40590
111     500      RH=RB+AKR(12)                                40600
112     510      IF (AKR(22)) 530,520,530                    40610
113     520      RH=RH+AKR(20)*P**AKR(21)                    40620
114     530      IF (AKR(25)) 550,540,550                    40630
115     540      RH=RH+AKR(23)*P**AKR(24)                    40640
116     550      IF (AKR(26)) 560,570,560                    40650
117     560      RH=RH+AKR(26)/(AKR(27)*P**AKR(28)+AKR(29)*P**AKR(30)) 40660
118     570      IF (G) 580,640,580                          40670
119     580      IF (RTAUE) 590,630,590                      40680
120     590      TRL=HLE-BOE                                  40690
121     600      IF (THE-TAUZ(1)) 620,620,610                40700
122     610      HHR=TAUZ(1)+BOE                              40710
123      GO TO 630                                           40720
124     620      HHR=HLE                                       40730
125     630      HRB=HHR+AINCW                                40740
126      IF (HRB.LT.HHR) HRB=HHR                            40750
127      IF (HRB .EQ. 0.0) RETURN                            40760
128      RB=RB+AKR(31)*G**AKR(32)*EXP (-AKR(34)*RBH1*DELF/G)/HRB**AKR(33) 40770
129      RETURN                                              40780
130      END                                                  40790

```

SYMBOL	-----	REFERENCES	-----
10	-	18	19*
20	-	20	21*
30	-	22	23*
40	-	23	24*
50	-	23	26*
60	-	25	26
70	-	29*	28*
80	-	29	31*
90	-	34	35*
100	-	35	36*
110	-	30	38*
120	-	41	42*
130	-	42	43*
140	-	44	45*
150	-	44	47*
160	-	20	22
170	-	51	52*
180	-	51	53*
190	-	53	54*
210	-	18	41
220	-	55	56*
230	-	55	58*
240	-	58	59*
250	-	59	60*
260	-	59	62*
270	-	58	64*
272	-	64	65*
273	-	66*	71
274	-	64	70*
276	-	64	65
278	-	69	75*
280	-	79	80*
290	-	80	81*
300	-	83	84*
310	-	83	85*
320	-	79	80
330	-	89	90*
340	-	89	90
350	-	90	93*
360	-	94	95*
370	-	94	97*
380	-	97	98*
390	-	97	99*
400	-	99	100*
410	-	99	101*
420	-	101	102*
430	-	101	103*
440	-	103	104*
450	-	96	103
460	-	105	106*
470	-	105	108*
480	-	108	109*
490	-	108	110*

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SUBROUTINE RBSUB

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500	-	110	111*																
510	-	110	112*																
520	-	112	113*																
530	-	112	114*																
540	-	114	115*																
550	-	107	114	116*															
560	-	116	117*																
570	-	116	118*																
580	-	118	119*																
590	-	119	120*																
600	-	121*																	
610	-	121	122*																
620	-	121	124*																
630	-	119	123	125*															
640	-	34	35	37	57	61	63	92	118	129*									
AANN	-	1400																	
ABCYL	-	800																	
ACCEL	-	800																	
AHO	-	1000																	
AIG	-	1400																	
AINCHI	-	800																	
AINCW	-	1300	125																
AKG	-	300	76																
AKGY	-	1300																	
AKR	-	300	66	67	68	72	73	74	91	93	95	97	98	99					
		100	101	102	103	104	106	108	109	110	111	112	113	114					
		115	116	117	128														
AKRADJ	-	1100	72	73	74														
AKRST	-	1300	40	47															
AKRTAU	-	400	47=	85AG															
AKRTMP	-	40=	86=	88=	91	93													
AKRTD	-	85AG	86																
AKR2	-	66=	72=	88															
AKR3B	-	68=	74=	91															
AKR4	-	67=	73=	93															
AKSLOT	-	300	62																
AKU	-	300	77																
ALITIL	-	1400																	
ALPX	-	1000																	
ALPY	-	1000																	
AMACH	-	800																	
AMINI	-	82																	
AMPN	-	1300																	
AMW	-	1300																	
ANIBU	-	800																	
ANLOPS	-	800																	
AOE	-	1400																	
AOHM	-	200																	
AP	-	1200																	
APHI	-	800																	
APX	-	1000																	
APY	-	1000																	
ARCO	-	1400																	
ARCJ	-	1400																	
ASEA	-	1700																	

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SUBROUTINE RBSUB

PAGE 34A

ASEB	-	17C0							
AS11	-	14C0							
ASLVK	-	10C0							
AT	-	13C0							
A1E	-	14C0							
BH	-	2C0							
BOE	-	14C0	120		122				
BRNOUT	-	12C0							
BTAOE	-	2C0	119						
BX	-	14C0							
B1E	-	14C0	120		124				
CKTIME	-	7C0	44		45=				
* CDMA	-	8*							
* COMG	-	9*							
* COMU	-	10*							
* COMS	-	11*							
DELF	-	6C0	128						
DELLRI	-	14C0							
DELT	-	8C0	29						
DELTA	-	13C0	78						
DEL1SS	-	5C0							
DEL1ST	-	5C0							
DEL1TO	-	5C0							
DELZ	-	6C0							
DH1	-	2C0							
D1S	-	13C0							
* DUMYM	-	7*							
* DWDOT	-	9C0							
* EXP	-	128							
G	-	78=	89	105	106	118	128		
GCR	-	76=	89						
HCU	-	6C0							
HHR	-	2C0	122=	124=	125	126			
HRB	-	125=	126	127	128				
HSUBMG	-	17C0							
ICHN	-	16C0	33	39					
LEND	-	11C0	26	64					
III	-	12C0	23	27	35	42	48	81	
IIJ	-	12C0							
IIS	-	12C0							
* INPUTA	-	2*							
* INPUTE	-	3*							
* INPUTF	-	4*							
* INPUTM	-	5*							
* INPUTU	-	6*							
IS1	-	12C0							
IS2	-	12C0							
KDUMP	-	6C0							
N	-	52=	54=	85AG					
NAKEND	-	3C0	65	70					
NAKR	-	3C0							
NAKRST	-	4C0	29	34	41	53	54		
NEND	-	17C0							
NI	-	12C0							
NINCPL	-	12C0	29	35	42				

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SUBROUTINE RRSUB

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IBLAKR	-	3C0				
IME	-	120=	121			
IMRI	-	14C0				
IMRO	-	14C0				
IMSLV	-	10C0				
IMSLVV	-	10C0				
IMAKR	-	3C0				
IME	-	13C0	29	44	45	
IMEPH	-	4C0				
IMEW	-	8C0				
IOFLAG	-	12C0	80	88		
IPR	-	11C0				
U	-	13C0	78	90	94	95
UCH	-	77=	90			
UI	-	8C0				
VF	-	9C0				
VP	-	9C0				
VSLVR	-	10C0				
WDOT	-	12C0				
WDOTD	-	12C0				
WDOTI	-	8C0				
XLIN	-	H5*				
YPI	-	14C0				
ZCALC	-	8C0				
ZI	-	14C0				
ZPI	-	14C0				

+-----+

1	SUBROUTINE RBVSUB	57690
	CC	57750
	C SUBROUTINE RBVSUB CHECKS THE VALIDITY OF THE BURNING RATE EQUATION	57770
	C CUNSTANTS AND PRINTS APPROPRIATE DIAGNOSTIC COMMENTS.	57780
	CC	57800
2	COMMON/INPUTE/ AKG(5), AKU(5), AKR(39), AKSLOI(2), NAKR, TIMAKR(25).	
	1 TBLAKR(25), NAKEND	
3	COMMON/PARMS/ ICHN	
4	IF(AKG(1)) 30, 10, 30	57820
5	10 IF(AKG(2)) 30, 20, 30	57830
6	20 IF(AKG(4)) 30, 80, 30	57840
7	30 IF(AKU(1)) 60, 40, 60	57850
8	40 IF(AKU(2)) 60, 50, 60	57860
9	50 IF(AKU(4)) 60, 80, 60	57870
10	60 WRITE(6, 70)	57880
11	70 FORMAT(32H0INVALID GCR OR UCR COEFFICIENTS)	57890
12	ICHN = 5	57900
13	RETURN	57910
14	80 IF(AKR(26)) 90, 140, 90	57920
15	90 IF(AKR(27)) 100, 120, 130	57930
16	100 WRITE(6, 110)	57940
17	110 FORMAT(21H0INVALID KR27 OR KR29)	57950
18	ICHN = 5	57960
19	RETURN	57970
20	120 IF(AKR(29)) 130, 100, 130	57980
21	130 IF(AKR(29)) 100, 140, 140	57990
22	140 RETURN	58000
23	END	

SYMBOL	-----	REFERENCES	-----
10	-	4	5*
20	-	5	6*
30	-	4	5
40	-	7	8*
50	-	8	9*
60	-	7	8
70	-	10WR	11*
80	-	6	9
90	-	14	15*
100	-	15	16*
110	-	16WR	17*
120	-	15	20*
130	-	15	20
140	-	14	21
AKG	-	200	4
AKH	-	200	14
AKSLOT	-	200	15
AKU	-	200	7
ICHN	-	300	12=
INPUTE	-	2*	18=
NAKEND	-	200	
NAKR	-	200	
PAHMS	-	3*	
RBYSUB	-	1*	
RETURN	-	13*	19*
IBLAKR	-	200	22*
IMAKR	-	200	

SYMBOL	-----	REFERENCES	-----
10	-	6	7*
20	-	7	8*
30	-	6	9*
40	-	7	11*
50	-	8	13*
60	-	13	14*
70	-	13	20*
80	-	8	26*
90	-	10	12
AAA	-	14=	18AG
AFF	-	500	
ATNC	-	200	
AJPP	-	500	
AL	-	500	
ALA	-	200	
ALB	-	200	
ALE	-	200	
ALFE	-	400	
ALFEM	-	400	
ALL	-	500	
ALS1	-	200	
ALSP	-	200	
AND	-	200	
AOEM	-	300	
ASE	-	500	
ASI	-	500	
AW	-	200	
BBB	-	15=	18AG
BE	-	300	13
CAE	-	400	20
CBE	-	400	20
CCC	-	17=	18AG
CCCE	-	400	14
CCVE	-	400	14
CCCE	-	400	15
CDVE	-	400	15
CECE	-	400	17
CEVE	-	400	17
* COMT	-	5*	
DE1	-	300	
* FDGWE	-	24*	
HE	-	500	
HEU	-	400	
HER	-	400	
HE1	-	400	
HE2	-	400	
PLIT	-	20=	24AG
QLIT	-	21=	24AG
RA	-	500	
RAU	-	500	
RC	-	500	
* RCSUB	-	1*	
* RETURN	-	27*	

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ORIGINAL PAGE IS
OF POOR QUALITY

I N D E X

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END

SUBROUTINE RGISUB

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SYMBOL	REFERENCES
10	13*
20	14*
30	15*
40	16*
50	19*
70	27*
80	28*
110	37*
120	38*
130	42*
AANN	1100
APP	800
ATG	1100
AINC	500
AJBN	1000 36
AJBN	1000
AJBHO	600 26= 36= 45
AJBN	1000
AJBHO	600 14= 35= 43
AJPP	800 35
AJSTH	700
AJSTH	700
AL	800
ALA	500
ALB	500
ALDP	900
ALF	500
ALHO	900
ALITL	1100
ALL	800
ALW	600
ALS1	500
ALS2	500
AMTI	600
AMTJ	600
ANO	500
AOE	1100 23
AUHM	300
ARCO	1100
ARCI	1100
ASE	800
ASI	800
ASII	1100
AW	500
AE	1100
BH	300 24 29= 39=
BHOLD	700 28= 39
BUE	1100 14 15 20 21 23 25 26
BTAOE	300 29
BX	1100
BIE	1100 13 15 20 22 24 25 26
COMC	6*
COMD	7*

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SUBROUTINE R01SUB

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TAUHD	-	30=	33	40				
TAUW	-	5C0	14	17	30	31=	40=	
IDMAX	-	9C0						
TEMP	-	16=	18	20=	22	25=	26	
TEMP1	-	17=	18	21=	22	23=	24	
TEMP5	-	19=	22					
TEMP6	-	24=	26					
THRI	-	11C0						
THRO	-	11C0						
VST0	-	9C0						
VSTR	-	9C0						
WBE	-	13=	18	19	22	24	27	
WI	-	8C0						
WIG	-	15=	16	19	20	25	26	27
WLE	-	14=	17	19	21	23	27	
WOKKA	-	5C0						
WT	-	8C0	12=	37	38=	43	45	
WTL	-	27=	37	38				
WTST	-	7C0						
XBAR1	-	10C0	37					
XBARIE	-	22=	37					
XBARIH	-	8C0	37=					
XBARST	-	7C0						
XBIH	-	6C0						
XMAX	-	9C0	42					
XR	-	8C0						
YMAX	-	9C0	44					
YPI	-	11C0						
ZI	-	11C0						
ZMAX	-	9C0	42					
ZPI	-	11C0						

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1      SUBROUTINE ROE1SB                                76630
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 76690
C      SUBROUTINE ROE1SB DETERMINES THE RADIUS OF CURVATURE, RHO1, AT THE 76710
C      POINT P1 ON THE PSEUDOELLIPSOID FOR THE BLOCK 2A ANALYSIS IN 76720
C      SUBROUTINE SCI (SECTION 5.2.1,2).                76730
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 76750
2      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1          ALS1,ALS2,ALA,ALB,ALE,AW(5)
3      COMMON/PARMH/B1E,B0E,AANY,BX,RXX,AS1,DELLRI,ROPE4,A1E,YPI,ZPI,
1          ARCO,ARCI,ROE1,ALITTL,Z1,AIG,THRI,THRO,AOE
4      IF (RF/10000.+ZPI-RF+TAUW) 10,20,20                76770
5      10 TEMP1=ZPI**2/YPI**2                                76780
6      TEMP2=B0E**2/AOE**2
7      TEMP3=TEMP2**2                                        76800
8      TEMP4=(TEMP3*TEMP1+TEMP2)/YPI                        76810
9      ROE1=(TEMP3*TEMP1+1.)**(3./2.)/TEMP4                76820
10     20 RETURN                                           76830
11     END

```

SYMBOL	-----	REFERENCES	-----
10	-	4	5*
20	-	4	10*
AANN	-	300	
AIG	-	300	
AINC	-	200	
ALA	-	200	
ALB	-	200	
ALE	-	200	
ALITTL	-	300	
ALS1	-	200	
ALS2	-	200	
AND	-	200	
AOE	-	300	6
ARCO	-	300	
ARCL	-	300	
AS11	-	300	
AW	-	200	
AIE	-	300	
BOE	-	300	6
BX	-	300	
BIE	-	300	
UELLMI	-	300	
PANMH	-	3*	
RETURN	-	10*	
RF	-	200	4
RUE1	-	300	9*
RUEISH	-	1*	
ROPE4	-	300	
RXX	-	300	
R2	-	200	
R3	-	200	
R4	-	200	
R5	-	200	
R6	-	200	
R7	-	200	
RB	-	200	
TAUW	-	200	4
TEMP1	-	5=	8 9
TEMP2	-	6=	7 8
TEMP3	-	7=	8 9
TEMP4	-	8=	9
THR1	-	300	
THR0	-	300	
WORKA	-	2*	
YPI	-	300	5 8
Z1	-	300	
ZP1	-	300	4 5

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7256-10920-4

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SYMBOL	-----	REFERENCES	-----
10	-	8	9*
20	-	9	10*
30	-	9	12*
40	-	8	14*
50	-	14	15*
60	-	14	18*
70	-	11	13 17 20*
AAAA	-	4C0	
AAP	-	2C0	
ABH	-	5C0	
ABP	-	3C0	
AFF	-	6C0	
AJPP	-	6C0	
AL	-	6C0	
ALDP	-	7C0	14
ALHO	-	7C0	
ALL	-	6C0	
ALTA	-	4C0	
ALTAP	-	2C0	
ALTb	-	5C0	
ALIBP	-	3C0	
ASE	-	6C0	
ASI	-	6C0	
BA	-	4C0	
BAP	-	2C0	
BB	-	5C0	
BBP	-	3C0	
BTAOA	-	4C0	
BTAUAP	-	2C0	
BTAUB	-	5C0	
BTAUBP	-	3C0	
CA	-	4C0	
CAP	-	2C0	
CB	-	5C0	
CBP	-	3C0	
COMI	-	6*	
COMV	-	7*	
COSGA1	-	4C0	
COSGA2	-	4C0	
COSGB1	-	5C0	
COSGB2	-	5C0	
COSTKA	-	4C0	
COSTKB	-	5C0	
CIRAP	-	2C0	
CIRHP	-	3C0	
DA	-	4C0	
DAP	-	2C0	
DB	-	5C0	
DBP	-	3C0	
D01A	-	7C0	
D01B	-	7C0	
GAMAI A	-	4C0	
GAMAIH	-	5C0	

I N D E X

SUBROUTINE ROPSB(K)

PAGE 365

GAMA2A	-	4C0		
GAMA2B	-	5C0		
GAM1AP	-	2C0		
GAM1BP	-	3C0		
GAM2AP	-	2C0		
GAM2BP	-	3C0		
HE	-	6C0		
K	-	1AG	8	
OAP	-	2C0		
OBP	-	3C0		
RA	-	6C0		
RAA	-	4C0		
RAAP	-	2C0		
RAB	-	5C0		
RABP	-	3C0		
RAO	-	6C0		
RC	-	6C0		
* RETURN	-	20*		
ROPE1	-	7C0	10=	12=
ROPE2	-	7C0	15=	18=
ROPE3	-	7C0	16=	19=
* ROPSB	-	1*		
SINGA1	-	4C0		
SINGA2	-	4C0		
SINGB1	-	5C0		
SINGB2	-	5C0		
SINTKA	-	4C0		
SINTKB	-	5C0		
SOAP	-	2C0		
SOBP	-	3C0		
STRAP	-	2C0		
STRBP	-	3C0		
SUMUV	-	6C0		
TANG2A	-	4C0		
TANG2B	-	5C0		
TANP1A	-	4C0		
TANP1B	-	5C0		
TAU	-	6C0	9	14
IDMAX	-	7C0		
TG2AP	-	2C0		
TG2BP	-	3C0		
THRA	-	4C0		
THRAP	-	2C0		
THRB	-	5C0		
THRBP	-	3C0		
TP1BP	-	3C0		
VSTO	-	7C0		
VSTR	-	7C0		
WI	-	6C0		
WT	-	6C0		
XBA*IH	-	6C0		
XMAX	-	7C0		
XOA	-	4C0		
XOAP	-	2C0		
* XOAPW	-	2*		

I N D E X

SUBROUTINE ROPSH(K)

PAGE 346

b	XOAWOH	-	4*		
	XOH	-	5C0		
	XOBP	-	3C0		
*	XOBPW	-	3*		
p	XOBWOH	-	5*		
	XH	-	5C0		
	XRAIA	-	4C0		
	XRAIAP	-	2C0		
	XRAIB	-	5C0		
	XRAIBP	-	3C0		
	XIA	-	4C0		
	XIAP	-	2C0		
	XIB	-	5C0		
	XIBP	-	3C0		
	XIA	-	4C0		
	X2AP	-	2C0		
	X2B	-	5C0		
	X2BP	-	3C0		
	X3A	-	4C0		
	X3B	-	5C0		
	YMAX	-	7C0		
	YOA	-	4C0	12	18
	YOAP	-	2C0	18	
	YOB	-	5C0	12	19
	YOBP	-	3C0	19	
	YIA	-	4C0		
	YIAP	-	2C0		
	YIB	-	5C0		
	YIBP	-	3C0		
	YIA	-	4C0		
	Y2AP	-	2C0		
	Y2B	-	5C0		
	Y2BP	-	3C0		
	Y3A	-	4C0		
	Y3B	-	5C0		
	ZMAX	-	7C0		
	ZOA	-	4C0		
	ZOAP	-	2C0		
	ZOB	-	5C0		
	ZOBP	-	3C0		
	ZIA	-	4C0		
	ZIAP	-	2C0		
	ZIB	-	5C0		
	ZIBP	-	3C0		
	Z2A	-	4C0		
	Z2AP	-	2C0		
	Z2B	-	5C0		
	Z2BP	-	3C0		
	Z3A	-	4C0		
	Z3B	-	5C0		

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P256-1 m21-4

24	20	TDMAX=TAUWDM	
25		YMAX=0.	49540
26		VSTR=0.	49550
27		XMAX=0.	49560
28		ZMAX=0.	49570
29		KVSTM=1	49580
30		ROPE4=R1*W2DM	
31		KRASHB=1	49600
32		KXASHB=1	49610
33		KGAM=1	49620
34		ASI=0.	49630
35		AS11=0.	49640
36		AL(1)=K2DM*(1.570795-A(1))	
37		ALSUBX=AL(1)	49660
38	30	DELL0=DELL01	49670
39		IF (ALSUBX-SCON) 820,820,40	49680
40	40	ALP=0.	49690
41	50	CALL ASUBC	49700
42		IF (ICMN.EQ.5) GO TO 840.	49710
43		TEMP1=(ZOA-Z3A)**2	49720
44		TEMP2=(YOA-Y3A)**2	49730
45		D11=SQRT((XOA-X3A)**2+TEMP2+TEMP1)	49740
46		IF (TAU-DOJ) 80,80,60	49750
47	60	ALP=ALP+0.1*ALSUBX	49760
48		IF (ALP-ALSUBX) 50,70,70	49770
49	70	ALP=ALSUBX-ALSUBX*0.1	49780
50	80	HOLDR=ALP	49790
51		IF (ALSUBX-DELL0) 100,90,90	49800
52	90	ALP=DELL0	49810
53		GO TO 110	49820
54	100	ALP=ALSUBX	49830
55	110	CALL BSUBC	49840
56		IF (ICMN.EQ.5) GO TO 840	49850
57		IF (DOJ-TDMAX) 150,120,120	49860
58	120	TDMAX=DOJ	49870
59		XMAX=X3A	49880
60		YMAX=Y3A	49890
61		ZMAX=Z3A	49900
62		IF (TAUM-TDMAX) 130,130,150	49910
63	130	WRITE(5,140) L,DOJ,TDMAX,TAUM	49920
64	140	FORMAT(24H0TDMAX GREATER THAN TAUM/IJ,JE15,7)	49930
65		ICMN=5	49940
66		GO TO 840	49950
67	150	DPS=SQRT((XOA-XOB)**2+(YOA-YOB)**2+(ZOA-ZOB)**2)	49960
68		DPK=DPS	49970
69		DOJ=SQRT((XOB-X3B)**2+(YOB-Y3B)**2+(ZOB-Z3B)**2)	49980
70		DELL0=AKK*DELL0+ZERODV(DPR+DPS)	49990
71		ALP=HOLDR	50000
72		IF (ALSUBX-ALP-DELL0) 170,160,160	50010
73	160	ALP=ALP+DELL0	50020
74		GO TO 180	50030
75	170	ALP=ALSUBX	50040
76	180	CALL BSUBC	50050
77		IF (ICMN.EQ.5) GO TO 840	50060
78		K=1	50070

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79	CALL KOPSB(K)	50080
80	TEMP1=(ALTA+ALT8)*(OPR+DPS)/4.*ASI	50090
81	TEMP4=K2DM-TAU	
82	IF (TEMP4) 190,200,200	50110
83	190 TEMP4=0.0	50120
84	200 TEMP4=(ALP-HOLDR)*(TEMP4)*ZERODV(R2DM)*ROPE1/2.	501
85	ASI1=ASI1+TEMP4	50140
86	ASI=TEMP4+TEMP1	50150
87	D01A=SQRT((X0A-X1A)**2+(Y0A-Y1A)**2+(Z0A-Z1A)**2)	50160
88	D01B=SQRT((X0B-X1B)**2+(Y0B-Y1B)**2+(Z0B-Z1B)**2)	50170
89	IF (TAU) 220,210,220	50180
90	210 CALL VSTRSB	50190
91	220 IF (ALSUBX-ALP) 230,820,230	50200
92	230 CALL IRAN(RAB,KAA,46)	50210
93	HOLDR=ALP	50220
94	ALP=ALP+DELL0	50230
95	IF (ALP-ALSUBX) 110,110,240	50240
96	240 ALP=ALSUBX	50250
97	GO TO 110	50260
98	250 KVSIR=2	50270
99	KRASHB=2	50280
100	KXRSHB=2	50290
101	KGAM=2	50300
102	ALXX=ALADM	
103	KHRAK=1	50320
104	260 DELLO=DELL01	50330
105	IF (ALXX=.02) 820,820,270	50340
106	270 ALP=0.	50350
107	280 CALL ASUBC	50360
108	IF (ICHN.EQ.5) GO TO 840	50370
109	D03=SQRT((X0A-X3A)**2+(Y0A-Y3A)**2+(Z0A-Z3A)**2)	50380
110	IF (TAU-D03) 310,290,290	50390
111	290 ALP=ALP+.1*ALXX	50400
112	IF (ALP-ALXX) 280,300,300	50410
113	300 ALP=ALXX-.1*ALXX	50420
114	310 HOLDR=ALP	50430
115	IF (ALXX-DELL0) 330,320,320	50440
116	320 ALP=DELL0	50450
117	GO TO 340	50460
118	330 ALP=ALXX	50470
119	340 CALL BSUBC	50480
120	IF (ICHN.EQ.5) GO TO 840	50490
121	IF (D03-TDMAX) 360,350,350	50500
122	350 TDMAX=D03	50510
123	XMAX=X3A	50520
124	YMAX=Y3A	50530
125	ZMAX=Z3A	50540
126	IF (TAUM+.001-TDMAX) 130,130,360	50550
127	360 DPR=SQRT((X0A-X0B)**2+(Y0A-Y0B)**2+(Z0A-Z0B)**2)	50560
128	DPS=DPR	50570
129	D03=SQRT((X0B-X3B)**2+(Y0B-Y3B)**2+(Z0B-Z3B)**2)	50580
130	DELL0=AKK*DELL0*ZERODV(OPR+DPS)	50590
131	IF (DELL0) 370,370,380	50600
132	370 DELL0=DELL01	50610
133	380 ALP=HOLDR	50620

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134      IF (ALXX-ALP-DELL0)400,390,390      50630
135      ALP=ALP+DELL0                        50640
136      GO TO 410                             50650
137      400  ALP=ALXX                         50660
138      410  CALL BSUBC                        50670
139      CALL BRKSB                             50680
140      K=1                                    50690
141      CALL RUPSB(K)                          50700
142      ASI=ASI+ROPE1*BRK/2.                  50710
143      ASI=ROPE1*BRK/2.+(ALTA+ALTB)*(DPH+OPS)/4.*ASI 50720
144      DO1A=SQR((X0A-X1A)**2+(Y0A-Y1A)**2+(Z0A-Z1A)**2) 50730
145      DO1B=SQR((X0B-X1B)**2+(Y0B-Y1B)**2+(Z0B-Z1B)**2) 50740
146      IF (TAU)430,420,430                  50750
147      420  CALL VSTRSB                       50770
148      430  IF (ALXX-ALP)440,820,440          50780
149      440  IZZ = 46                          50790
150      CALL TRAN(RAB,XAA,IZZ)                 50800
151      HOLUR=ALP                              50810
152      ALP=ALP+DELL0                          50820
153      IF (ALP-ALXX)340,340,450              50830
154      450  ALP=ALXX                          50840
155      GO TO 340                              50850
156      460  ALUP=T2M                          50860
157      DELL0=DELL01                          50870
158      AL3A=(T2M-RJOM)*SIN((A(1)-A(2))/2.)*ZERODV(COS((A(1)-A(2))/2.))
159      IF (AL3A)470,820,470                  50890
160      470  ALP=0.                            50900
161      KRASBB=3                              50910
162      KXRSBB=3                              50920
163      KGAM=3                                50930
164      CALL HASUBC                             50940
165      IF (ICHN.EQ.5)GO TO 840                50950
166      KRASBB=4                              50960
167      KXRSBB=4                              50970
168      KGAM=4                                50980
169      CALL HHSUBC                             50990
170      IF (ICHN.EQ.5)GO TO 840                51000
171      IZ7 = 38                              51020
172      CALL TRAN(X0A,X0,IZ7)                  51030
173      HOLUR=ALP                              51040
174      IF (AL3A-DELL0)490,480,480            51050
175      480  ALP=DELL0                          51060
176      GO TO 500                              51070
177      490  ALP=AL3A                          51080
178      500  KRASBB = 3                        51090
179      KXRSBB=3                              51100
180      KGAM=3                                51110
181      CALL HAPSB                                51120
182      IF (ICHN.EQ.1)GO TO 840                51130
183      KRASBB=4                              51140
184      KXRSBB=4                              51150
185      KGAM=4                                51160
186      CALL HHPSB                                51170
187      IF (ICHN.EQ.5)GO TO 840                51180
188      IZ7 = 38                              51200

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189      CALL TRAN(XOAP,XO,IZZ)
190      CALL DPRASB
191      DELLO=DELLO*AKK*ZERODV(DPRA+DPSA)
192      ALP=HOLDR
193      IF (ALJA-ALP-DELLO) 520,510,510
194      510 ALP=ALP+DELLO
195      GO TO 530
196      520 ALP=ALJA
197      530 KRASHB = 3
198      KXRSHB=3
199      KGAM=3
200      CALL HAPSB
201      IF (ICHN.EQ.5) GO TO 840
202      KRASHB=4
203      KXRSHB=4
204      KGAM=4
205      CALL HPSB
206      IF (ICHN.EQ.5) GO TO 840
207      IZZ = 38
208      CALL TRAN(XOAP,XO,IZZ)
209      K=2
210      CALL RUPSB(K)
211      DPSA=0.
212      DPRA=0.
213      TEMP1=ROPE3*SWRT((XOH-XOHP)**2+(ZOH-ZOHP)**2)/2.
214      IF MP1=TEMP1+ROPE2*SWRT((XOA-XOAP)**2+(ZOA-ZOAP)**2)/2.
215      ASI1=ASI1+TEMP1
216      ASI=ASI+TEMP1
217      IF (ALJA-ALP) 540,820,540
218      540 IZZ = 46
219      CALL TRAN(RAAP,RAA,IZZ)
220      IZZ = 46
221      CALL TRAN(RABP,RAB,IZZ)
222      HOLDR=ALP
223      ALP=ALP+DELLO
224      IF (ALJA-ALP) 550,500,500
225      550 ALP = ALJA
226      GO TO 500
227      560 KRASHB = 5
228      KXRSHB=5
229      KGAM=5
230      AL(3)=(A(1)-A(2))*R3DM
231      ALSUBX=AL(3)
232      RXX=R3DM
233      570 DELLO = DELLO1
234      IF (ALSUBX) 580,820,580
235      580 ALP = 0.
236      CALL HASUBC
237      IF (ICHN.EQ.5) GO TO 840
238      590 ALP = ALSUBX
239      500 CALL HBSUBC
240      IF (ICHN.EQ.5) GO TO 840
241      IZZ = 38
242      CALL TRAN(XOA,XO,IZZ)
243      K=1

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244		CALL ROPSB(K)	51790
245	610	TEMP=ALP*(RXX-TAU)*ROPE1*ZERODV(2,*RXX)	51800
246		ASI1=ASI1+TEMP	51810
247		ASI=ASI+TEMP	51820
248		GO TO 820	51830
249	620	KVSTR=1	51840
250		KRASBB=6	51850
251		KXRSBB=6	51860
252		KGAM=6	51870
253		KHRAK=1	51880
254		ALXX=ALBDM	
255		K=2	
256		GO TO 260	51900
257	630	KVSTR=4	51910
258		KRASBB=7	51920
259		KXRSBB=7	51930
260		KGAM=7	51940
261		KHRAK=2	51950
262		AL(5)=(A(3)-A(2))*R4DM	51960
263		ALXX=AL(5)	
264		GO TO 260	51980
265	640	KVSTR=5	51990
266		KRASBB=8	52000
267		KXRSBB=8	52010
268		KGAM=8	52020
269		KHRAK=1	52030
270		ALXX=ALC	52040
271		GO TO 260	52050
272	650	KVSTR=6	52060
273		KHRAK=3	52070
274		KRASBB=9	52080
275		KXRSBB=9	52090
276		KGAM=9	52100
277		AL(7)=(PI02*TH2-A(3))*R5DM	52110
278		ALXX=AL(7)	
279		GO TO 260	52130
280	660	KVSTR=7	52140
281		KRASBB=10	52150
282		KHRAK=3	52160
283		KXRSBB=10	52170
284		KGAM=10	52180
285		AL(9)=(PI02*TH3-A(4))*R6DM	52190
286		ALXX=AL(9)	
287		GO TO 260	52210
288	670	KVSTR=8	52220
289		KRASBB=11	52230
290		KXRSBB=11	52240
291		KGAM=11	52250
292		KHRAK=1	52260
293		ALXX=ALD	52270
294		GO TO 260	52280
295	680	ALDP=T12M	52290
296		DELL0=DELL01	52300
297		AL11A=(T12M-R7DM)*TAN((A(5)-A(4))/2.)	52310
298		IF (AL11A) 690,820,690	52330

299	690	ALP=0.	52340
300		KRASBB=12	52350
301		KXRSBB=12	52360
302		KGAM=12	52370
303		CALL HASUBC	52380
304		IF(ICHN.EQ.5)GO TO 840	52390
305		KRASBB=13	52400
306		KXRSBB=13	52410
307		KGAM=13	52420
308		CALL HRSUBC	52430
309		IF(ICHN.EQ.5)GO TO 840	52440
310		IZZ = 38	52460
311		CALL TRAN(XOA,XO,IZZ)	52470
312		HOLDR=ALP	52480
313		IF(AL11A-DELL0)710,700,700	52490
314	700	ALP=DELL0	52500
315		GO TO 720	52510
316	710	ALP=AL11A	52520
317	720	KRASBB=12	52530
318		KXRSBB=12	52540
319		KGAM=12	52550
320		CALL HAPSB C	52560
321		IF(ICHN.EQ.5)GO TO 840	52570
322		KRASBB=13	52580
323		KXRSBB=13	52590
324		KGAM=13	52600
325		CALL HBPSB C	52610
326		IF(ICHN.EQ.5)GO TO 840	52620
327		IZZ = 38	52640
328		CALL TRAN(XOAP,XO,IZZ)	52650
329		CALL DPRASH	52660
330		DELL0=DELL0*AKK*ZERODD*(DPSA+DPSA)	52670
331		ALP=HOLDR	52680
332		IF(AL11A-ALP-DELL0)740,730,730	52690
333	730	ALP=ALP+DELL0	52700
334		GO TO 750	52710
335	740	ALP=AL11A	52720
336	750	KRASBB=12	52730
337		KXRSBB=12	52740
338		KGAM=12	52750
339		CALL HAPSB C	52760
340		IF(ICHN.EQ.5)GO TO 840	52770
341		KRASBB=13	52780
342		KXRSBB=13	52790
343		KGAM=13	52800
344		CALL HBPSB C	52810
345		IF(ICHN.EQ.5)GO TO 840	52820
346		IZZ = 38	52840
347		CALL TRAN(XOAP,XO,IZZ)	52850
348		K=2	52860
349		CALL ROPSB(K)	52870
350		DPSA=0.	52880
351		DPSA=0.	52900
352	760	TEMP1=ROPE3*SQRT((XOB-XOBP)**2+(ZOB-ZOBP)**2)/2.	52920
353		TEMP1=TEMP1+ROPE2*SQRT((XOA-XOAP)**2+(ZOA-ZOAP)**2)/2.	

354		AS11=AS11+TEMP1	52940
355		AS1=AS1+TEMP1	
356		IF (AL11A-ALP) 770,820,770	52970
357	770	I27 = 46	52980
358		CALL TRAN(RAAP,RAA,I2Z)	52990
359		I27 = 46	53000
360		CALL TRAN(RAAP,RAR,I2Z)	53010
361		HOLDR=ALP	53020
362		ALP=ALP+DELLD	53030
363		IF (AL11A-ALP) 780,720,720	53040
364	780	ALP=AL11A	53050
365		GO TO 720	53060
366	790	KRASHB=14	53070
367		KXRSBB=14	53080
368		KGAM=14	53090
369		AL(11)=(A(5)-A(4))*R7DM	
370		ALSURX=AL(11)	53110
371		RXX=R7DM	
372		GO TO 570	53130
373	800	KVSTR=9	53140
374		KBRAR=1	53150
375		KRASBB=15	53160
376		KXRSBB=15	53170
377		KGAM=15	53180
378		ALXX=ALEUM	
379		GO TO 260	53200
380	810	KVSTR=10	53210
381		KOPE4=K9+R8DM	
382		KRASBB=16	53230
383		KXRSBB=16	53240
384		KGAM=16	53250
385		AL(13)=(PID2-A(5))*R8DM	
386		ALSURX=AL(13)	53270
387		KK=2	53280
388		GO TO 30	53290
389	820	IF (KK) 840,840,830	53300
390	830	KOPE4=K1+R7DM	
391	840	RETURN	53320
392		END	

SYMBOL	-----	REFERENCES	-----
10	- 21	22*	
20	- 24*		
30	- 38*	388	
40	- 39	40*	
50	- 41*	48	
60	- 46	47*	
70	- 48	49*	
80	- 46	50*	
90	- 51	52*	
100	- 51	54*	
110	- 53	55*	95 97
120	- 57	58*	
130	- 62	63*	126
140	- 63WR	64*	
150	- 57	62	67*
160	- 72	73*	
170	- 72	75*	
180	- 74	76*	
190	- 82	83*	
200	- 82	84*	
210	- 84	90*	
220	- 89	91*	
230	- 91	92*	
240	- 95	96*	
250	- 21	98*	
260	- 104*	256	271 274 287 294 379
270	- 105	106*	
280	- 107*	112	
290	- 110	111*	
300	- 112	113*	
310	- 110	114*	
320	- 115	116*	
330	- 115	118*	
340	- 117	119*	153 155
350	- 121	122*	
360	- 121	126	127*
370	- 131	132*	
380	- 131	133*	
390	- 134	135*	
400	- 134	137*	
410	- 136	138*	
420	- 146	147*	
430	- 146	148*	
440	- 148	149*	
450	- 153	154*	
460	- 21	156*	
470	- 159	160*	
480	- 174	175*	
490	- 174	177*	
500	- 176	178*	224 226
510	- 193	194*	
520	- 193	196*	
530	- 195	197*	

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PAGE 37A

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I N D E X

SUBROUTINE SCI(L)

PAGE 379

	GAMIBP	-	8CO												
	GAM2AP	-	7CO												
	GAM2BP	-	8CO												
	GNOT	-	2CO												
*	HAPSBC	-	181*	200*	320*	339*									
*	HASUBC	-	164*	236*	303*										
*	HAPSBC	-	186*	205*	325*	344*									
*	HBSUBC	-	169*	239*	308*										
	HE	-	14CO												
	HOLUR	-	17CO	50=	71	84	93=	114=	133	151=	173=	192	222=	312=	331
			361=												
	ICHN	-	20CO	42	56	65=	77	108	120	165	170	182	187	201	206
			237	240	304	309	321	326	340	345					
*	INPUTC	-	4*												
*	INPUT1	-	3*												
	IZZ	-	149=	150AG	171=	172AG	188=	189AG	207=	208AG	218=	219AG	220=	221AG	241=
			242AG	310=	311AG	327=	328AG	346=	347AG	357=	358AG	359=	360AG		
	K	-	78=	79AG	140=	141AG	209=	210AG	243=	244AG	255=	348=	349AG		
	KBRAR	-	17CO	103=	253=	261=	269=	273=	282=	292=	374=				
	KGAM	-	19CO	33=	101=	163=	168=	180=	185=	199=	204=	229=	252=	260=	268=
			276=	284=	291=	302=	307=	319=	324=	338=	343=	368=	377=	394=	
	KK	-	23=	387=	389										
	KRASHH	-	19CO	31=	99=	161=	166=	178=	183=	197=	202=	227=	250=	258=	266=
			274=	281=	289=	300=	305=	317=	322=	336=	341=	366=	375=	382=	
	KVSTH	-	17CO	29=	98=	249=	257=	265=	272=	280=	288=	373=	380=		
	KXRSBH	-	19CO	32=	100=	162=	167=	179=	184=	198=	203=	228=	251=	259=	267=
			275=	283=	290=	301=	306=	318=	323=	337=	342=	367=	376=	383=	
	L	-	1AG	21	63WR										
	OAP	-	7CO												
	OBP	-	8CO												
*	PARMH	-	16*												
*	PARML	-	17*												
*	PARMN	-	18*												
*	PARMO	-	19*												
*	PARMS	-	20*												
	PI	-	2CO												
	PIOP	-	2CO	277	285	385									
	RA	-	14CO												
	RAA	-	9CO	92AG	150AG	219AG	358AG								
	RAAP	-	7CO	219AG	358AG										
	RAB	-	10CO	92AG	150AG	221AG	360AG								
	RABP	-	8CO	221AG	360AG										
	RADIAN	-	2CO												
	RAO	-	14CO												
	RC	-	14CO												
*	RETURN	-	391*												
	RF	-	3CO												
	RFUM	-	6CO												
	ROE1	-	16CO												
	ROPE1	-	15CO	84	142	143	245								
	ROPE2	-	15CO	214	353										
	ROPE3	-	15CO	213	352										
	ROPE4	-	16CO	30=	381=	390=									
*	ROPSB	-	79*	141*	210*	244*	349*								
	RPA	-	17CO												

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[illegible]

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I N D E X

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PAGE 383

Z1B	-	1000	88	145		
Z1BP	-	800				
Z2	-	1100				
Z2A	-	900				
Z2AP	-	700				
Z2B	-	1000				
Z2BP	-	800				
Z3	-	1100				
Z3A	-	900	43	61	109	125
Z3B	-	1000	69	129		

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34		XOB=XO	77650
35		YOB=YO	77660
36		KRASHB=5	77670
37		CALL RASUBB	77680
38		CALL POSUB	77690
39		X3A=XO	77700
40		Y3A=YO	77710
41		ALP=AL(3)	77720
42		CALL RASUBB	77730
43		CALL POSUB	77740
44		X3B=XO	77750
45		Y3B=YO	77760
46		VSTR=VSTR+(YOA+Y3A+YOB+Y3B)*AL3A*(T2M+R3)/4.+(A(1)-A(2))*(YOB+Y3B)	77770
		X*R3**2/4.	77780
47		ALP=0.	77790
48		KRASHB=12	77800
49		CALL RASUBB	77810
50		CALL POSUB	77820
51		XOA=XO	77830
52		YOA=YO	77840
53		KRASHB=13	77850
54		CALL RASUBB	77860
55		CALL POSUB	77870
56		XOB=XO	77880
57		YOB=YO	77890
58		KRASHB=14	77900
59		CALL RASUBB	77910
60		CALL POSUB	77920
61		Y11A=YO	77940
62		ALP=AL(11)	77950
63		CALL RASUBB	77960
64		CALL POSUB	77970
65		Y11B=YO	77990
66		VSTR=VSTR+(T12M+R7)*(YOA+Y11A+YOB+Y11B)*AL11A/4.+(A(5)-A(4))*R7**2	78000
		X*(YOB+Y11B)/4.	78010
67	20	ABJUR=(ASI-AS11)*2.*AANN	78020
68		IF(TAU)40,30,40	78030
69	30	ASTU=0.	78040
70		TAULST=0.	78050
71		ASHOLD=0.	78060
72	40	ASTU=ASTU+(TAU-TAULST)*(ASI+ASHOLD)/2.	78070
73		ASHOLD=ASI	78080
74		TAULST=TAU	78090
75		WI=0.	78100
76		WT=0.	78110
77		AMSI=0.	78120
78		AMSJ=0.	78130
79		XBAH1H=0.	78140
80		XBIH=0.	78150
81		AJBHN=0.	78160
82		AJPHN=0.	78170
83		AMTI=0.	78180
84		AMTJ=0.	78190
85		DELLR=DELLRI	78200
86		IF(TAU)60,50,60	78210

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87      50 XP1 = R2*CO5A(1) 78220
88      YP1=(1.-SINA(1))*R2+R1 78230
89      RP1=SQRT(XP1**2+YP1**2) 78240
90      H20 TEMP=(T2M-R3)*TAN((A(1)-A(2))/2.)
91      XP2=XP1+(TEMP*ALA)*SINA(1) 78260
92      YP2=YP1+(TEMP*ALA)*CO5A(1) 78270
93      RP2=SQRT(XP2**2+YP2**2) 78280
94      XP3=T2M*CO5A(2)-TEMP*SINA(2) 78290
95      YP3=(ALA-T2M*SINA(2)*CO5A(1))/CO5A(1)+R2+R1-TEMP*CO5A(2) 78300
96      RP3=SQRT(XP3**2+YP3**2) 78310
97      XP4=XP3+(ALB+AL3A)*SINA(2) 78320
98      YP4=YP3+(ALB+AL3A)*CO5A(2) 78330
99      RP4=SQRT(XP4**2+YP4**2) 78340
100     XP5=XP4*(CO5A(2)-COS(A(3)))*R4 78350
101     YP5=YP4-R4*(SINA(2)-SIN(A(3))) 78360
102     RP5=SQRT(XP5**2+YP5**2) 78370
103     XP6=XP5+ALC*SINA(3) 78380
104     YP6=YP5+ALC*CO5A(3) 78390
105     RP6=SQRT(XP6**2+YP6**2) 78400
106     XP13=RH*CO5A(5) 78410
107     YP13=RH+R9-RB*SINA(5) 78420
108     RP13=SQRT(XP13**2+YP13**2) 78430
109     TEMP=TAN((A(5)-A(4))/2.)*(T12M-R7) 78440
110     XP12=XP13+SINA(5)*(TEMP+ALE) 78450
111     YP12=YP13+CO5A(5)*(TEMP+ALE) 78460
112     RP12=SQRT(XP12**2+YP12**2) 78470
113     XP11=T12M*CO5A(4)-TEMP*SINA(4) 78480
114     YP11=RH+R9-TEMP*CO5A(4)+(ALE-T12M*SINA(4)*CO5A(5))/CO5A(5) 78490
115     RP11=SQRT(XP11**2+YP11**2) 78500
116     XP10=XP11+SINA(4)*(ALD+AL11A) 78510
117     YP10=YP11+CO5A(4)*(ALD+AL11A) 78520
118     RP10=SQRT(XP10**2+YP10**2) 78530
119     60 IF(RTG)70,RU,70 78540
120     70 ZP0=RIG 78550
121     IZ7 = 3 78560
122     CALL YPSUB(ZP0,BTAE,BDE,YP0,ARCO,IZZ) 78570
123     GO TO 90 78580
124     H0 ZP0=0. 78590
125     YP0=0. 78600
126     90 HULDR=ZP0 78610
127     IF(RF-TAUW-ZP0-DELLR)110,100,100 78620
128     100 ZP1=DELLR+ZP0 78630
129     GO TO 120 78640
130     110 ZP1=RF-TAUW 78650
131     120 IZZ = 3 78660
132     CALL YPSUB(ZP1,BTAE,BDE,YP1,ARCO,IZZ) 78670
133     DS=SQRT((ZP1-ZP0)**2+(YP1-YP0)**2) 78680
134     ZP1=HULDR 78690
135     IF(DS)130,140,130 78700
136     130 DELLR=DELLR+A/K/DS 78710
137     140 IF(RF-TAUW-ZP1-DELLR)160,150,150 78720
138     150 ZP1=ZP1+DELLR 78730
139     GO TO 170 78740
140     160 ZP1=RF-TAUW 78750
141     170 CALL YPSUB(ZP1,BTAE,BDE,YP1,ARCO,3)

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142		CALL YPSUB(ZPO,BTAE,BDE,YPO,ARCO,1)	
143		CALL YPSUB(ZP1,BTAE,BDE,YPI,ARCI,2)	
144		CALL ROE1SH	78870
145		CALL LBSUB	78830
146		CALL ZISUB	78840
147		IF(SIN(ARCI))*TAU+ZP1-ZI)190,180,180	78850
148	180	AS=ASI	78860
149		GO TO 220	78870
150	190	ALQ=(RDE1+TAU)*(ARCI-ARCO)	78880
151		IF(KMOICG)210,200,210	
152	200	CALL MSISUB	78900
153		AJPHN=AJPHN+AMSJ	78910
154		AJBHN=AJBHN+AMSJ	78920
155	210	AS=ASI+((ZPO+ZP1)/2.+TAU*SIN((ARCO+ARCI)/2.))*ALQ*3.14159/AANN	78930
156	220	AST=AS	78940
157		IF(RF/10000.+ZP1-RF+TAUW)230,250,250	78950
158	230	ZPO=ZP1	78960
159		YPO=YPI	78970
160		HOLUR=ZP1	78980
161		ZP1=ZP1+DELLR	78990
162		IF(ZP1-RF+TAUW)120,120,240	79000
163	240	ZP1=RF-TAUW	79010
164		GO TO 120	79020
165	250	CALL AIGSUB	79030
166		AST=ASI+AIG	79040
167	260	RETURN	79050
168		END	

I N D E X

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SYMBOL	-----	REFERENCES	-----
10	-	24	25*
20	-	24	67*
30	-	68	69*
40	-	68	72*
50	-	86	87*
60	-	86	119*
70	-	119	120*
80	-	119	124*
90	-	123	126*
100	-	127	128*
110	-	127	130*
120	-	129	131*
130	-	135	136*
140	-	135	137*
150	-	137	138*
160	-	137	140*
170	-	139	141*
180	-	147	143*
190	-	147	150*
200	-	151	152*
210	-	151	153*
220	-	149	156*
230	-	157	158*
240	-	162	163*
250	-	157	165*
260	-	167*	
820	-	90*	
A	-	5C0	46
AAAA	-	8C0	66
AANN	-	20C0	67
ABH	-	9C0	155
ABIGH	-	17C0	67*
AFF	-	16C0	
AHH	-	12C0	
ATG	-	20C0	166
* AIGSUH	-	165*	
AINC	-	7C0	
AJBHED	-	12C0	
AJBHN	-	12C0	81*
AJBHO	-	13C0	154*
AJBNOZ	-	12C0	
AJPHED	-	12C0	
AJPHN	-	12C0	82*
AJPHO	-	13C0	153*
AJPN0Z	-	12C0	
AJPP	-	16C0	
AK	-	4C0	
AKK	-	4C0	136
AL	-	16C0	41
ALA	-	7C0	91
ALB	-	7C0	97
ALC	-	6C0	103
ALD	-	6C0	116

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ALDP	-	18C0							
ALE	-	7C0	110	111	114				
ALHO	-	18C0							
ALITQ	-	17C0							
ALITTL	-	20C0							
ALL	-	16C0							
ALP	-	22C0	25=	41=	47=	62=			
ALQ	-	13C0	150=	155					
ALS1	-	7C0							
ALS2	-	7C0							
ALTA	-	8C0							
ALTH	-	9C0							
ALTO	-	10C0							
AL11A	-	21C0	66	116	117				
AL3A	-	21C0	46	97	98				
AMSI	-	14C0	77=	153					
AMSJ	-	14C0	78=	154					
AMTI	-	13C0	83=						
AMTJ	-	13C0	84=						
ANO	-	7C0							
AO	-	10C0							
AOE	-	20C0							
AQHM	-	3C0							
ARCU	-	20C0	122AG	142AG	150	155			
ARCI	-	20C0	132AG	141AG	143AG	147	150	155	
AS	-	21C0	148=	155=	156				
ASE	-	16C0							
ASHULO	-	11C0	71=	72	73=				
ASI	-	16C0	67	72	73	148	155	156=	166=
ASII	-	20C0	67						
ASIO	-	17C0	69=	72=					
AW	-	7C0							
AZ	-	15C0							
Alt	-	20C0							
BA	-	8C0							
BB	-	9C0							
bH	-	3C0							
BO	-	10C0							
BOE	-	20C0	122AG	125	132AG	141AG	142AG	143AG	
BRAC	-	21C0							
BTAO	-	10C0							
BTAOA	-	8C0							
BTAOB	-	9C0							
BIAOE	-	3C0	122AG	132AG	141AG	142AG	143AG		
BX	-	20C0							
BIE	-	20C0							
B71M	-	6C0							
B72M	-	6C0							
B91M	-	6C0							
B92M	-	6C0							
CA	-	8C0							
CB	-	9C0							
CO	-	10C0							
* COMB	-	12-							
* CUMC	-	13-							

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#	COMF	-	14*												
#	COMR	-	15*												
#	COMT	-	16*												
#	COMU	-	17*												
#	COMV	-	18*												
#	COMX	-	19*												
#	CONSTS	-	2*												
#	COS	-	100												
	COSA	-	19C0	87	92	94	95	98	100	104	106	111	113	114	117
	COSGA1	-	8C0												
	COSGA2	-	8C0												
	COSGB1	-	9C0												
	COSGB2	-	9C0												
	COSGM1	-	10C0												
	COSGM2	-	10C0												
	COSTHR	-	10C0												
	COSTRA	-	8C0												
	COSTRB	-	9C0												
	COUNT	-	17C0												
	DA	-	8C0												
	DB	-	9C0												
	DELLR	-	15C0	85=	127	128	136=	137	138	161					
	DELLRI	-	20C0	85											
	DHI	-	3C0												
	DHRF	-	4C0												
	DO	-	10C0												
	DO1A	-	18C0												
	DO1B	-	18C0												
	DRVRF	-	4C0												
	DS	-	21C0	133=	135	136									
	DTAUX	-	19C0												
	DTAUX	-	19C0												
	DTINT	-	12C0												
#	DUWYO	-	11*												
	GAMA1A	-	8C0												
	GAMA1B	-	9C0												
	GAMA2A	-	8C0												
	GAMA2B	-	9C0												
	GNUT	-	2C0												
	HE	-	16C0												
	HHR	-	3C0												
	HOLDR	-	21C0	126=	134	160=									
#	INPUTA	-	3*												
#	INPUTC	-	4*												
#	INPUTO	-	5*												
	I2Z	-	121=	122AG	131=	132AG									
	KBRAR	-	21C0												
	KGAM	-	22C0												
	KMOICG	-	5C0	151											
	KPLANE	-	5C0												
	KRASBB	-	22C0	26=	31=	36=	48=	53=	58=						
	KVSTR	-	21C0												
	KXRSBB	-	22C0												
#	LBSUB	-	145*												
#	MSISUB	-	152*												

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PAGE 192

SINGB1	-	900										
SINGB2	-	900										
SINGM1	-	1000										
SINGM2	-	1000										
SINTHR	-	1000										
SINTKA	-	800										
SINTRH	-	900										
* SQR1	-	89	93	96	99	102	105	108	112	115	118	133
SUMUV	-	1600										
* TAN	-	90	109									
TANGM2	-	1000										
TANG2A	-	800										
TANG2B	-	900										
TANPH1	-	1000										
TANPH1A	-	800										
TANPH1H	-	900										
TAU	-	1600	24	68	72	74	86	147	150	155		
TAUAD	-	1200										
TAULST	-	1100	70=	72	74=							
TAUM	-	600										
TAUW	-	700	127	130	137	140	157	162	163			
TOMAX	-	1800										
TEMP	-	90=	91	92	94	95	109=	110	111	113	114	
THRA	-	800										
THRB	-	900										
THRI	-	2000										
THRU	-	2000										
THRZ	-	2300										
TH1	-	600										
TH2	-	600										
TH3	-	600										
TH4	-	600										
T10M	-	600										
T12M	-	600	66	109	113	114						
T2M	-	600	45	90	94	95						
T4M	-	600										
T5M	-	600										
T6M	-	600										
T7M	-	500										
T9M	-	600										
VEX	-	1700										
VFHEWI	-	1700										
VR	-	1700										
VRX	-	1700										
VSTO	-	1800										
VSTR	-	1800	46=	66=								
WI	-	1600	75=									
* WORKA	-	7*										
* WORK45	-	6*										
WT	-	1600	76=									
XBAH1H	-	1800	79=									
XBH	-	1200										
XBIH	-	1300	80=									
XBN	-	1200										
XMAX	-	1800										

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	X0	-	10C0	29	34	39	44	51	56
	X0A	-	8C0	29=	51=				
*	X0AWOR	-	8*						
	X0B	-	9C0	34=	56=				
*	X0BWOR	-	9*						
*	X0WORK	-	10*						
	XP2	-	15C0						
	XP1	-	23C0	67=	89	91			
	XP10	-	116=	118					
	XP11	-	23C0	113=	115	116			
	XP12	-	110=	112					
	XP13	-	23C0	106=	108	110			
	XP2	-	91=	93					
	XP3	-	23C0	94=	96	97			
	XP4	-	97=	99	100				
	XP5	-	23C0	100=	102	103			
	XP6	-	103=	105					
	XR	-	16C0						
	XRAYA	-	8C0						
	XRAYB	-	9C0						
	X011	-	6C0						
	X03	-	6C0						
	X05	-	6C0						
	X07	-	6C0						
	X09	-	6C0						
	X1	-	10C0						
	X1A	-	8C0						
	X1B	-	9C0						
	X2	-	10C0						
	X2A	-	8C0						
	X2B	-	9C0						
	X3	-	10C0						
	X3A	-	8C0	39=					
	X3B	-	9C0	44=					
	X45	-	6C0						
	X76	-	6C0						
	YMAX	-	18C0						
	Y0	-	10C0	30	35	40	45	52	57
	Y0A	-	8C0	30=	46	52=	66		65
	Y0B	-	9C0	35=	46	57=	66		
	YP1	-	20C0	132AG	133	141AG	143AG	159	
	YPU	-	21C0	122AG	125=	133	142AG	159=	
*	YPSUB	-	122*	132*	141*	142*	143*		
	YP1	-	88=	89	92				
	YP10	-	117=	118					
	YP11	-	114=	115	117				
	YP12	-	111=	112					
	YP13	-	107=	108	111				
	YP2	-	92=	93					
	YP3	-	95=	96	98				
	YP4	-	98=	99	101				
	YP5	-	101=	102	104				
	YP6	-	104=	105					
	Y011	-	6C0						
	Y03	-	6C0						

[illegible]

I N D E X

SUBROUTINE SCTOR2

PAGE 395

1	SUBROUTINE SCTOR2	79070
	CC	79110
C	SUBROUTINE SCTOR2 IS THE CONTROL ROUTINE TO DETERMINE THE SURFACE	79130
C	AREA ON THE PSEUDOELLIPSOID OF THE PROJECTED PROPELLANT CORF IN	79140
C	THE BLOCK 2B ANALYSIS OF THE HEAD-END WITH WEB (SECTION 5.2.1.3).	79150
	CC	79170
2	COMMON/INPUTC/AK,AKK,DLEF,DRVRF	
3	COMMON/COMV/VSTR,VSTO,TDMAX,D01A,D01B,XMAX,ZMAX,YMAX,ALHO,	
	1 ROPE1,ROPE2,ROPE3,ALOP	
4	VSTO=0.	79190
5	AKK=AKK/2.	79200
6	DO 10 I=1,7	79210
7	10 CALL S2SK(I)	79220
8	I=I+1	79230
9	20 CALL S2SK(I)	79240
10	I=I-1	79250
11	IF (I-9) 30,20,20	79260
12	30 AKK=2.*AKK	79270
13	RETURN	79280
14	END	

SYMBOL		REFERENCES									
10	-	600	7*								
20	-	9*	11								
30	-	11	12*								
AK	-	2C0									
AKK	-	2C0	5=	12=							
ALDP	-	3C0									
ALHO	-	3C0									
* LOMV	-	3*									
DLRF	-	2C0									
DDIA	-	3C0									
DDIH	-	3C0									
DRVRF	-	2C0									
I	-	600	7AG	8=	9AG	10=	11				
* INPUTC	-	2*									
* RETURN	-	13*									
ROPE1	-	3C0									
ROPE2	-	3C0									
ROPE3	-	3C0									
* SCTOR2	-	1*									
* S2SK	-	7*	9*								
IDMAX	-	3C0									
VSTO	-	3C0	4=								
VSTR	-	3C0									
XMAX	-	3C0									
YMAX	-	3C0									
ZMAX	-	3C0									

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1      SUBROUTINE SDID13(IEX)                                45580
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 45730
C      SUBROUTINE SDID13 DETERMINES THE CENTER OF GRAVITY AND MOMENTS OF 45750
C      INERTIA OF THE STRAIGHT THROUGH GRAIN END SECTIONS (SECTION 5.3). 45760
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 45780
2      COMMON/CONSTS/GNOT,PI,PI02,RADIAN
3      COMMON/INPUTU/DELTA,PA,PHI,HCO,DELZ,KDUMP(72)
4      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1      ALS1,ALS2,ALA,ALB,ALE,AW(5)
5      COMMON/COMB/AHH,AJPHN,AJBHN,TAUAO,AJPHED,AJBHED,AJPN0Z,AJRV0Z,
1      XBH,XBN,DTINT
6      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,
1      RAO,ALL,AJPP,ASI
7      COMMON/PARM0/KRASUB,KXRSUB,AJHH,HEI,AJHN,AJRH,XHARI
8      COMMON/PARME/RCG,DELLI,XBARIN,HCR,KWITI,KWIT2,LSWITI,ALSX,
1      AJPN,AJPH
9      COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,P0V,DIS,AMPN,AT,
1      AMW,AKHST
10     COMMON/PARMH/BIE,BOE,AANN,BX,HXX,ASII,DELLRI,ROPE4,AIE,YPI,ZPI,
1      ARCD,ARCI,ROEI,ALITIL,ZI,AIG,THRI,THRO,AOE
11     COMMON/PARMAB/HSUBMG,NSJBMG,NEND,ASEA,ASEB,SUM0VA,SUMDVH
12     COMMON/PARMAC/HEA,HEB,AEEA,AEEB,DVA,DVB,HEIA,HEIB,AWEA,AWEB,DELTA
13     COMMON/PARMAE/XBARIA,XBARIH,AJPPA,AJPPH,AJBHA,AJBHH
14     COMMON/PARMAF/WIA,WIB,WTA,WTB
15     IEX=1
16     IF (ALSX) 210,210,10
17     10    ALL=0.
18     CALL KRASUB(KRASUB)
19     IF (RF-TAUW+TAUAO-RA) 20,20,50
20     20    IF (LSWITI-1) 30,30,40
21     30    IEX=2
22     GO TO 210
23     40    IEX=3
24     GO TO 210
25     50    CALL XRSUB(KXRSUB)
26     CALL HESUB
27     RAO=RA
28     HEI=HE
29     HEIA=HEA
30     HEIB=HEB
31     THRO=1.570795-ACOS(XR*ZERODV(RAO))
32     ALL=DELLI
33     IF (ALL-ALSX) 70,70,60
34     60    ALL=ALSX
35     70    CALL KRASUB(KRASUB)
36     IF (RF-TAUW+TAUAO-RA) 80,90,90
37     80    RA=RF-TAUW+TAUAO
38     90    CALL XRSUB(KXRSUB)
39     CALL HESUB
40     THRI=1.570795-ACOS(XR*ZERODV(RA))
41     GO TO (100,110),KWITI
42     100   AJPP=AJPP+(THRI+THRO)/4.*AANN*(RA**4-RA0**4)
43     WT=WT+(THRI+THRO)/2.*AANN*(RA**2-RA0**2)
44     AKGY=SQRT(AJPP*ZERODV(WT))
45     GO TO 170

```

45800
45810
45820
45830
45840
45850
45860
45870
45880
45890
45900
45910
45920
45930

45940
45950
45960
45970
45980
45990
46000
46010
46020
46030
46040
46050
46060
46070
46080

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46 110 TEMP1=(THR1+THRO)*AANN*DELTA      46090
47 TEMP2=RA**2-RAO**2                    46100
48 TEMP3=HE+HEI                          46110
49 WI=TEMP1*TEMP2*TEMP3/4.              46120
50 TEMP2=TEMP3*WI/4.                    46130
51 XBARI=(WT*XBARI+TEMP2)*ZERODV(WI+WT)  46140
52 WT=WT+WI                              46150
53 AJPX=(RA**2-RAO**2)*WI/(2.*GNOT)
54 AJPP=AJPP+AJPX                        46170
55 IF(NEND.EQ.1.OR.VSUBMG.EQ.0) GO TO 115
56 TEMP3=HEA+HEIA
57 WIA=TEMP1*(RA**2-RAO**2)*TEMP3/4.
58 TEMP2=TEMP3*WIA/4.
59 XBARIA=(WTA*XBARIA+TEMP2)*ZERODV(WIA+WTA)
60 WTA=WTA+WIA
61 AJPXA=(RA**2-RAO**2)*WIA/(2.*GNOT)
62 AJPPA=AJPPA+AJPXA
63 TEMP3=HEB+HEIB
64 WIB=TEMP1*(RA**2-RAO**2)*TEMP3/4.
65 TEMP2=TEMP3*WIB/4.
66 XBARIH=(WTH*XBARIH+TEMP2)*ZERODV(WIB+WTH)
67 WTB=WTB+WIB
68 AJPXB=(RA**2-RAO**2)*WIB/(2.*GNOT)
69 AJPPB=AJPPB+AJPXB
70 115 IF(AINCW-HCO)120,130,120
71 120 RCG=(HE+HEI)/4.+HCH              46190
72 GO TO 140                            46200
73 130 RCG=(HE+HEI)/4.                  46210
74 140 AJBH=AJBH+((HE+HEI)/2.)*2*WI/(12.*GNOT)+AJPX/2.+WI*RCG**2/GNOT
75 IF(NEND.EQ.1.OR.VSUBMG.EQ.0) GO TO 145
76 RCGA=(HEA+HEIA)/4.
77 AJBHA=AJBHA+((HEA+HEIA)/2.)*2*WIA/(12.*GNOT)
78  $+AJPXA/2.+WIA*RCGA**2/GNOT
79 KCGH=(HEB+HEIB)/4.
80 AJBBH=AJBBH+((HEB+HEIB)/2.)*2*WIB/(12.*GNOT)
81  $+AJPXB/2.+WIB*KCGH**2/GNOT
82 145 IF(AINCW-HCO)150,160,150
83 150 XHARIH=XBARI                    46250
84 XRH=XBARI                          46260
85 AJPH=AJPP                          46270
86 AJPHED=AJPP                        46280
87 AJRH=AJBB                          46290
88 AJBHEO=AJBH                        46300
89 GO TO 170                          46310
90 160 XRN=XBARI
91 AJPNZ=AJPP                        46360
92 AJBNZ=AJBB                        46380
93 170 IF(ALL-ALSX)180,210,210        46390
94 180 ALL=ALL+DELLI                  46400
95 IF(ALL-ALSX)200,200,190           46410
96 190 ALL=ALSX                        46420
97 200 THRO=THR1                      46430
98 RAO=RA                            46440
99 HEI=HE                            46450
100 HEIA=HEA

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I N D E X

SUBROUTINE SD1D13(1EX)

PAGE 399

99 HEJB=HEB
100 IF(RF-TAUW+TAU-RAO) 210,210,70
101 RETURN
102 END

46460
46470

SYMBOL	-----	REFERENCES	-----
10	-	16	17*
20	-	19	20*
30	-	20	21*
40	-	20	23*
50	-	19	25*
60	-	33	34*
70	-	33	35*
80	-	36	37*
90	-	36	38*
100	-	41	42*
110	-	41	46*
115	-	55	70*
120	-	70	71*
130	-	70	73*
140	-	72	74*
145	-	75	80*
150	-	80	81*
160	-	40	83*
170	-	45	87
180	-	91	92*
190	-	93	94*
200	-	93	95*
210	-	16	22
AANN	-	1000	42
THE VARIABLE- ACOS			
ACOS	-	31	40
AEEA	-	1200	
AEEB	-	1200	
AFF	-	600	
AHH	-	500	
AIG	-	1000	
AINC	-	400	
AINCW	-	900	70
AJBH	-	700	74=
AJBHA	-	1300	77=
AJBHB	-	1300	79=
AJBH	-	700	85=
AJBHED	-	500	86=
AJBHN	-	500	
AJBH	-	700	
AJBNOZ	-	500	90=
AJPH	-	800	83=
AJPHEI	-	500	84=
AJPHN	-	500	
AJPN	-	800	
AJPNUZ	-	500	89=
AJPP	-	600	42=
AJPPA	-	1300	62=
AJPPB	-	1300	69=
AJPX	-	53=	54
AJPXA	-	61=	62
AJPXB	-	68=	69
AKGY	-	900	44=

100

91*

24 91 100 101*

43 46
-IS USED BEFORE IT IS DEFINED

80 85 86 90

44 54= 83 84 89

74
77
79

I N D E X

SUBROUTINE SD1D13(IEX)

PAGE 401

AKRST	-	9C0							
AL	-	6C0							
ALA	-	4C0							
ALB	-	4C0							
ALE	-	4C0							
ALITTL	-	10C0							
ALL	-	6C0	17=	32=	33	34=	91	92=	93
ALSX	-	8C0	16	33	34	91	93	94	94=
ALS1	-	4C0							
ALS2	-	4C0							
AMPN	-	9C0							
ANW	-	9C0							
ANO	-	4C0							
AOE	-	10C0							
ARCO	-	10C0							
AHC1	-	10C0							
ASE	-	6C0							
ASEA	-	11C0							
ASEB	-	11C0							
ASI	-	6C0							
AS11	-	10C0							
AT	-	9C0							
AW	-	4C0							
AWEA	-	12C0							
AWEB	-	12C0							
AIE	-	10C0							
BOE	-	10C0							
BX	-	10C0							
BIE	-	10C0							
* COMB	-	5*							
* COMT	-	6*							
* CONSTS	-	2*							
DELF	-	3C0	46						
DELH	-	12C0							
DELL1	-	8C0	32	92					
DELLR1	-	10C0							
DELTA	-	9C0							
DELZ	-	3C0							
DIS	-	9C0							
DTINT	-	5C0							
DVA	-	12C0							
DVB	-	12C0							
GNUT	-	2C0	53	61	68	74	77	79	
HCO	-	3C0	70	80					
HCR	-	8C0	71						
HE	-	6C0	28	48	71	73	74	97	
HEA	-	12C0	29	56	76	77	98		
HEB	-	12C0	30	63	78	79	99		
HEI	-	7C0	28=	48	71	73	74	97=	
HEIA	-	12C0	29=	56	76	77	98=		
HEIB	-	12C0	30=	63	78	79	99=		
* HESUB	-	26*	39*						
MSUBMG	-	11C0							
IEX	-	1AG	15=	21=	23=				
* INPUTU	-	.3*							

3-101

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I N D E X

SUBROUTINE SD1013(IEX)

PAGE 402

KDUMP	-	3C0												
KRASUB	-	7C0	18A6	35A6										
KWIT1	-	8C0	41											
KWIT2	-	8C0												
KXRSUB	-	7C0	25A6	38A6										
LSWIT1	-	8C0	20											
NEND	-	11C0	55	75										
NSUHM6	-	11C0	55	75										
P	-	9C0												
PA	-	3C0												
* PARMAB	-	11*												
* PARMAC	-	12*												
* PAKMAE	-	13*												
* PARMAF	-	14*												
* PARMOD	-	7*												
* PARME	-	8*												
* PARMF	-	9*												
* PARMH	-	10*												
PH	-	9C0												
PHI	-	3C0												
PI	-	2C0												
PI02	-	2C0												
PON	-	9C0												
RA	-	6C0	19	27	36	37=	40	42	43	47	53	57	61	64
	-	68	96											
RADIAN	-	2C0												
RA0	-	6C0	27=	31	42	43	47	53	57	61	64	68	96=	100
* RASUB	-	18*	35*											
RC	-	6C0												
RCG	-	8C0	71=	73=	74									
RCGA	-	76=	77											
RCGB	-	78=	79											
* RETURN	-	101*												
RF	-	4C0	19	36	37	100								
ROE1	-	10C0												
ROPE4	-	10C0												
RXX	-	10C0												
R2	-	4C0												
R3	-	4C0												
R4	-	4C0												
R5	-	4C0												
R6	-	4C0												
R7	-	4C0												
R8	-	4C0												
* SD1013	-	1*												
* SQRT	-	44												
SUMDV	-	6C0												
SUMDVA	-	11C0												
SUMDVB	-	11C0												
T	-	9C0												
TAU	-	6C0	100											
TAUA0	-	5C0	19	36	37									
TAUW	-	4C0	19	36	37	100								
TEMP1	-	46=	49	57	64									
TEMP2	-	47=	49	50=	51	58=	59	65=	66					

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D256-10020-4

I N D E X

SUBROUTINE SUD13(IE)

PAGE 403

TEMP3	-	48=	49	50	56=	57	58	63=	64	65
THRI	-	10C0								
THRO	-	10C0	31=	42	43	46	95=			
THRI	-	40=	42	43	46	95				
TIME	-	9C0								
U	-	9C0								
WI	-	6C0	49=	50	51	52	53	74		
WIA	-	14C0	57=	58	59	60	61	77		
WIB	-	14C0	64=	65	66	67	68	79		
* WORKA	-	4*								
WT	-	6C0	43=	44	51	52=				
WIA	-	14C0	59	60=						
WTB	-	14C0	66	67=						
XBAR1	-	7C0	51=	81	82	88				
XBARIA	-	13C0	59=							
XBARIB	-	13C0	66=							
XBARIH	-	6C0	81=							
XBARIN	-	8C0								
XBH	-	5C0	82=							
XBN	-	5C0	88=							
XN	-	6C0	31	40						
* XRSUB	-	25*	38*							
YPI	-	10C0								
THE VARIABLE= ZERODV -[S USED BEFORE IT IS DEFINED										
ZERODV	-	31	40	44	51	59	66			
ZI	-	10C0								
ZPI	-	10C0								

[illegible]

3-404

U256-10020-4

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140      AKGY=AKGY
141      RF=RFY
142      AFF=AFY
143      GO TO 410
144      310  TAUMW=TAUMX+(AINCW-AINCX)*(TAUMY-TAUMX)/(AINCY-AINCX)
145           IF(TAUMW)315,320,315
146      315  IF(THOLD-TAUMW)330,330,320
147      320  ALP=0.
148           AFF=0.0
149           AL7=0.0
150           RF=RF+(RFY-RFX)*(AINCW-AINCX)/(AINCY-AINCX)
151           RSLVR=RSLVRX+(RSLVRY-RSLVRX)*(AINCW-AINCX)/(AINCY-AINCX)
152           AP=3.14159*RF**2.-AFF
153           GO TO 410
C      IF PERIMETER LENGTH AT UPSTREAM OR DOWNSTREAM R.P. GOES TO ZERO,
C      CHANGE PERIMETER INTERPOLATION SCHEME
154      330  IF(ALPX.EQ.0.0 .OR. ALPY.EQ.0.0) GO TO 331
155           GO TO 339
156      331  IF(ALPX.EQ.ALPY) GO TO 339
157           DO 334 I=1,KPLANE
158           IF(AINCX.EQ.AINCIN(I)) GO TO 335
159      334  CONTINUE
160           WRITE(6,335)
161      335  FORMAT('IAINCX NOT EXACTLY EQUAL TO AN AINCIN(I) VALUE IN SEGSUB*')
162           ICHN=5
163           RETURN
164      336  L=I
165           TAUMAX = TAUMX
166           IF(ALPX.EQ.0.0) GO TO 337
167           GO TO 338
168      337  L=L+1
169           TAUMAX = TAUMY
170      338  NDUMX=NGEO(L)
171      3372 TAUDUM = TAUMAX-(TAUMW-TAUDZ(I1))
172           DO 3373 I=1,NDUMX
173           DUMX1(I)=TAUPL(I,L)
174      3373  DUMX2(I)=ALPPL(I,L)
175           CALL XLJN(DUMX1,DUMX2,NDJMX,TAUDUM,ALP,20)
176           GO TO 3390
177      339  ALP=ALPX+(ALPY-ALPX)*(AINCW-AINCX)/(AINCY-AINCX)
178      3390  RF=RF+(RFY-RFX)*(AINCW-AINCX)/(AINCY-AINCX)
179           RSLVR=RSLVRX+(RSLVRY-RSLVRX)*(AINCW-AINCX)/(AINCY-AINCX)
180           AKGY=AKGYX+(AKGYX-AKGYX)*(AINCW-AINCX)/(AINCY-AINCX)
181           AFX=3.14159*RF**2.-APX
182           AFY=3.14159*RFY**2.-APY
183           IF(RSLVR)350,350,340
184      340  CONTINUE
185           THOLD=AMIN1(THOLD,(RSLVR+1.0E-06))
186      350  CONTINUE
187           TAU=THOLD
188           TEMP=(AINCW-AINCX)/(AINCY-AINCX)
189           IF(TAUMX)370,360,370
190      360  AFF=ALPX*(TAUMW-TAU)*(1.-TEMP)+AFY*TEMP**2
191           GO TO 400
192      370  IF(TAUMY)390,380,390

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```

42390
42400
42410
42420
42430
42440
45120
42450
42460
42470
42480
42490
42500
42510
42520
42530
42540
42550
42560
42570
42580
42590
42600
42610
42620
42630
42640
42650
42660
42670

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193 380 AFF=ALPY*(TAUMW-TAU)*TEMP*AFX*(1.-TEMP)**2 42680
194 GO TO 400 42690
195 390 AFF=AFX*(1.-TEMP)+(TAUMY-TAUMX)*TEMP/TAUMX-(TAUMY-TAUMX)*TEMP**2 42700
X/TAUMX)*AFY*(TAUMX*TEMP/TAUMY-(TAUMX-TAUMY)*TEMP**2/TAUMY) 42710
196 400 AP=J.14159*RF**2-AFF 42720
197 410 CONTINUE 42730
198 IF (HSLVR)440,440,420 42740
199 420 CONTINUE 42750
200 TAUZ(III)=AMIN1(TAUZ(III),(RSLVR+1.0E-06)) 42760
201 430 CONTINUE 42770
202 TAUZTO(III)=AMIN1(TAUZTO(III),(RSLVR+1.0E-06)) 42780
203 440 CONTINUE 42790
204 IF (KOUVR(6))470,470,450 42800
205 450 CONTINUE 42810
206 WRITE(6,460)AP,ALP,AFF,ALPX,ALPY,APX,APY,AINCW,AINCX,AINCY,TEMP, 42820
XIII 42830
207 460 FORMAT(4H AP=1PE11.4,2X,4HALP=1PE11.4,2X,4HAFF=1PE11.4,2X,5HALPX=1 42840
XPE11.4,2X,5HALPY=1PE11.4,2X,4HAPX=1PE11.4,2X,4HAPY=1PE11.4,7H AINC 42850
XW=1PE11.4,2X,6HAINCX=1PE11.4,2X,6HA INCY=1PE11.4,2X,5HTEMP=1PE11.4, 42860
+ 2X,4HIII=I2)
208 470 CONTINUE 42880
209 IF (TAUTO)500,500,480 42890
210 480 CONTINUE 42900
211 IF (TAUW(1)-TAUTO-TAU)490,490,500 42910
212 490 CALL LPTO 42920
213 ALTO=(AL7+AL8)*2.*ANO 42930
214 TOFLAG=1.0 42940
215 500 CALL RHSUB 42950
216 IF (ICN.EQ.5) RETURN 42960
217 TOFLAG=0.0 42970
218 HAZ(III)=RH 42980
219 IF (SLTFLG-5.0)510,540,540 42990
220 510 CONTINUE 43000
221 DWDOT=DELZ*DELF*((ALPHI-ALTOHI)*RHHI+(ALP-ALTO)*RB1)/2. 43010
222 IF (TIME .LT. DELT .AND. STFLAG .GT. 0.0)DWDOT=0.0
223 IF (PCTAB)530,530,520 43020
224 520 CONTINUE 43030
225 DWDOT=DWDOT*PCTAB 43040
226 530 DWDOT=AMAX1(DWDOT,0.0) 43050
227 540 IF (TAUTO)810,810,550 43060
228 550 CONTINUE 43070
229 IF (TAUW(1)-TAUTO-TAUTOZ)560,560,810 43080
230 560 TSLVR=AMIN1(RSLVR,TAUMW) 43090
231 IF (TSLVR)570,570,580 43100
232 570 TSLVR=TAUMW 43110
233 580 CONTINUE 43120
234 IF (TAUW(1)-TAUTOZ)590,590,600 43130
235 590 CONTINUE 43140
236 ZX = 0.0 43150
237 CALL XLIN(TAUAKR,AKRTAJ,N,N,ZX,AKRTO,21)
238 TAUOW=0.0 43170
239 N=1 43180
240 GO TO 660 43190
241 600 DO 620 I=1,NNN 43200
242 IF (TAUW(1)-TAUTOZ-TAUAKR(I))630,610,610 43210

```

31	EQUIVALENCE	(AX(38),TAUMX),(AY(38),TAUMY)	
32	DIMENSION	DUMX(50),DUMY(50)	
33	AL7=0.0		41280
34	AL8=0.0		41290
35	ALTO=0.0		41300
36	RB7=0.0		41310
37	RB8=0.0		41320
38	DW7=0.0		41330
39	DW8=0.0		41340
40	IF(TIME)10,10,20		41350
41	10 CONTINUE		41370
42	NTEST=0		41380
43	20 CONTINUE		41410
44	IF(NTEST-1)30,100,30		41420
45	30 CONTINUE		41430
46	IF(NRECON.GT.0) GO TO 80		
47	IF(STDYST-1.0)80,40,40		41440
48	40 CONTINUE		41450
49	NTEST=1		41460
50	IF(NTIME)80,80,50		41470
51	50 CONTINUE		41480
52	NN = NTIME		41490
53	NN=NTIME-1		41500
54	TAUTO=TAUAKR(NTIME)		
55	IF(NTAUTO.GT.0) TAUTO=0.0		
56	AKRTOM=0.0		41520
57	WRITE(6,60)		41540
58	60 FORMAT(1H1)		41550
59	WRITE(6,70) (I,TAUAKR(I),AKRTAU(I),I=1,NTIME)		41560
60	70 FORMAT(1HX,43HSTART TRANSIENT BURN RATE COEFFICIENT TABLE//1HX,1X,		41570
	1H1,7X,3HTAU,9X,3HAKR/(2X,13,2X,1PE11.4,2X,1PE11.4/1)		41590
61	80 IF(NAKRST)100,100,90		41600
62	90 NN = NAKRST		41610
63	NN=NAKRST-1		
64	100 IF(NTIME.GT.0) NNN=NTIME		
65	IF(NAKRST.GT.0) NNN=NAKRST		41640
66	IF((III-1)110,110,160		41650
67	110 CONTINUE		41660
68	IIS=1		41670
69	ABSLOT=0.0		
70	WGPORT=0.0		41740
71	ALP=ALPX		41690
72	AP=APX		41700
73	AKGY=AKGYX		41710
74	IF(TIME)120,120,130		41720
75	120 CONTINUE		41730
76	RF=RFI(1)		
77	130 RBZTO(1)=RB		41750
78	IF(TAUTO)160,160,140		41760
79	140 IF(TAUW(1)-TAUTO-TAUZTO(1))150,150,160		41770
80	150 CALL LPTO		41780
81	ALTO=(AL7+AL8)*2.*ANO		41790
82	GO TO 630		41800
83	160 IF(III-1)170,170,220		41810
84	170 TSLVR=AMINI(RSLVRX,TAUMX)		41820

85		IF (ISLVR) 180,180,190	41830
86	180	ISLVR=TAUMX	41840
87	190	IF (ISLVR-TAUTO-TAUZ(1)) 200,200,210	41850
88	200	RSLVR=ISLVR	41860
89		TOFLAG=1.0	41870
90	210	CALL RBSUB	41880
91		IF (ICHN.EQ.5) RETURN	41890
92		TOFLAG=0.0	41900
93		RBZ(1)=RB	41910
94	220	IF (SLTFLG) 230,230,970	41920
95	230	CONTINUE	41930
96		AINC1=ZCALC(III)	41940
97		IF (III.EQ.1) AINC1=0.0	41950
98	240	III=III+1	41960
99		IJJ=IIJ+1	41970
100		AINCW=ZCALC(III)	41980
101		TAU=TAUZ(III)	41990
102		TAUTOZ=TAUZTO(III)	42000
103		THOLD=TAU	42010
104		TEMP=(AINCW-AINCX)/(AINCY-AINCX)	42020
105		DELZ=AINCW-AINC1	42030
106		IF (AINCW-AINCX) 270,270,250	42040
107	250	CONTINUE	42050
108		IF (AINCY- SCUR(IIS,1))	42060
109	260	CONTINUE	42070
110		III=III-1	42080
111		IJJ=IIJ-1	42090
112		RETURN	42100
113	270	IF (AINCW- SCUR(IIS,1))	42110
114	280	AINCW=SCUR(IIS,1)	42120
115		DELZ=AINCW-AINC1	42130
116		TEMP=(AINCW-AINCX)/(AINCY-AINCX)	42140
117	290	PRNT(III,14)=RBZTO(III)	42150
118		AFHI=AF	42160
119		APHI=AP	42170
120		ALPHI=ALP	42180
121		AKGYHI=AKGY	42190
122		R8HI=RB	42200
123		RFHI=RF	42210
124		AL8HI=AL8	42220
125		AL7HI=AL7	42230
126		R88HI=R88	42240
127		R87HI=R87	42250
128		ALTOHI=ALTO	42260
129		AL7=0.0	42270
130		AL8=0.0	42280
131		ALTO=0.0	42290
132		R87=0.0	42300
133		R88=0.0	42310
134		DW7=0.0	42320
135		DW8=0.0	42330
136		IF (AINCW-AINCX) 310,300,310	42340
137	300	RSLVR=RSLVRY	42350
138		ALP=ALPY	42370
139		AP=APY	42380

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243	610	CONTINUE	43220
244	620	N=I+1	43230
245	630	TAUTOW=TAUW(1)-TAUTDZ	43240
246		TAUTOW=AMAX1(TAUTOW,0.0)	43250
247		IF(TAUTOW)640,640,650	43260
248	640	CONTINUE	43270
249		CALL XLIN(TAUAKR,AKRTAU,VN,ZX,AKRTO,22)	
250		GO TO 660	43290
251	650	CALL XLIN(TAUAKR,AKRTAU,VN,TAUTOW,AKRTO,23)	
252	660	AKRTOW=AKRTAU(1)	43310
253		TAUTOX=TSUVR-TAU	43320
254		TAUTOX=AMAX1(TAUTOX,0.0)	43330
255		IF(TAUTOX)670,670,680	43340
256	670	CONTINUE	43350
257		CALL XLIN(TAUAKR,AKRTAU,VN,ZX,AKRTOX,24)	
258		GO TO 800	43370
259	680	IF(TAUTOX-TAUTO)700,690,690	43380
260	690	CONTINUE	43390
261		M=NNN	43400
262		TAUTOX=TAUTO	43410
263		GO TO 730	43420
264	700	DO 720 I=1,NNN	43430
265		IF(TAUAKR(I)-TAUTOX)710,730,730	43440
266	710	CONTINUE	43450
267	720	M=I	43460
268	730	CALL XLIN(TAUAKR,AKRTAU,VN,TAUTOX,AKRTOX,25)	
269		IF(TAUTOX-TAUTOW)740,740,750	43480
270	740	CONTINUE	43490
271		TAUTOW=TAUTOX	43500
272		AKRTOW=AKRTOX	43510
273		GO TO 800	43520
274	750	AKRTOW=0.0	43530
275		IF(N-M)760,780,790	43540
276	760	CONTINUE	43550
277		NN=M-1	43560
278		DO 770 I=N,NN	43570
279	770	AKRTOW=AKRTOW+(AKRTAU(I)+AKRTAU(I+1))*((TAUAKR(I+1)-TAUAKR(I))/2.	43580
280	780	AKRTOW=AKRTOW+(AKRTO+AKRTAU(N))*((TAUAKR(N)-TAUTOX)/2.+	43590
		XAKRTAU(M)+AKRTOX)*(TAUTOX-TAUAKR(M))/2.	43600
		AKRTOW=AKRTOW/(TAUTOX-TAUTOW)	43610
281		GO TO 800	43620
282			
283	790	AKRTOW=(AKRTO+AKRTOX)/2.	43630
284	800	R8B=AKRTO*P**AKR(37)	43640
285		R87=AKRTOW*P**AKR(37)	43650
286		R8ZTO(III)=R87	43660
287		IF(III-1)160,160,820	43670
288	810	R87=R8	43680
289		R8A=R8	43690
290		R8ZTO(III)=R8	43700
291	820	IF(SLTFLG.LT.0.1)GO TO 930	43710
292		IF(SLTFLG=5.0)830,970,970	43720
293	830	CONTINUE	43730
294		DW8=ANU*(AL8*R8B+AL8HI*R8BHI)*DELZ*DELZ	43740
295		DW7=ANU*(AL7*R87+AL7HI*R87HI)*DELZ*DELZ	43750
296		IF(BRNOUT-1.0)870,840,840	43760

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297      840  IF(KDUMP(4))870,870,850          43770
298      850  WRITE(6,860)(AL(I),I=1,4),AL(7),AL(8),AL(7),AL(8),JDWDT,
      XDW7,DW8,RB7,RB8,AKRTO,IAUTOW,AKRTOX,IAUTOX,AKRTOX
      XKRTOW,N,NN,M,III                      43790
299      860  FORMAT(1HX,6HAL(1)=1PE11.4,1X,6HAL(2)=1PE11.4,1X,6HAL(3)=1PE11.4,1
      XX,6HAL(4)=1PE11.4,1X,6HAL(7)=1PE11.4,1X,6HAL(8)=1PE11.4/1HX,4HAL7=
      X1PE11.4,1X,4HAL8=1PE11.4,1X,6HDWDT=1PE11.4,4HDW7=1PE11.4,4HDW8=1P
      XE11.4,1X,4HRB7=1PE11.4,1X,4HRB8=1PE11.4/1HX,6HAKRTO=1PE11.4,1X,7HT
      XAUTOW=1PE11.4,1X,7HAKRTOX=1PE11.4,1X,7HIAUTOX=1PE11.4,1X,7HAKRTOX=
      X1PE11.4,1X,7HAKRTOW=1PE11.4/1HX,2HN=13,1X,3HNN=13,1X,2HNN=13,1X,4HI
      XII=13)                                43810
300      870  CONTINUE                        43820
301      DWDOT=DWDOT+DW7+DWH                  43830
302      IF(TIME.LT.DELT.AND.STFLAG.GT.0.0) DWDOT=0.0 43840
303      ABCYL=ABCYL+(ALPHI+ALP)*DELZ/2.      43850
304      900  VFI=(3.14159*RFHI**2.-APHI+3.14159*RF**2.-AP)*
      XDELZ/2.                                43860
305      IF(VFI)910,910,920                  43870
306      910  CONTINUE                        43880
307      VFI=0.0                              43890
308      920  VF=VF+VFI                      43900
309      TEMP1=(.25*(AINCW-AINCHI)+HCO-AINCW)*(3.14159*RF**2.-AP) 43910
310      AOMCYL=AOMCYL+((.75*(AINCW-AINCHI)+HCO-AINCW)*(3.14159*RFHI**2.-AP
      XHI)+TEMP1)*(AINCW-AINCHI)*DELZ/2.      43920
311      AIPCYL=AIPCYL+((3.14159*RFHI**2.-APHI)*AKGYHI**2.+(3.14159*RF**2.-AP)
      X*AKGY**2.)*(AINCW-AINCHI)*DELZ/(GNOT*2.) 43930
312      TEMP1=AKGY**2.                      43940
313      TEMP2=.25*(AINCW-AINCHI)+HCO-AINCW    43950
314      TEMP1=TEMP1+TEMP2**2.*2.             43960
315      TEMP1=TEMP1+(AINCW-AINCHI)**2./6.     43970
316      TEMP1=TEMP1*(3.14159*RF**2.-AP)/2.   43980
317      TEMP2=AKGYHI**2.                    43990
318      TEMP3=.75*(AINCW-AINCHI)+HCO-AINCW    44000
319      TEMP2=TEMP2+TEMP3**2.*2.             44010
320      TEMP2=TEMP2+(AINCW-AINCHI)**2./6.     44020
321      AIBCYL=AIBCYL+((3.14159*RFHI**2.-APHI)*TEMP2/2.+TEMP1) 44030
      X*DELZ*(AINCW-AINCHI)/(2.*GNOT)          44040
322      VP=VP+(APHI+AP)*(AINCW-AINCHI)/2.    44050
323      CALL AIBSRB(IE)                     44060
324      IF(IE.EQ.2)ICNN=5                   44070
325      IF(ICNN.EQ.5) RETURN                 44080
326      PD=P*(TO/T)**(GAMA/(GAMA-1.))        44090
327      930  AMACH=SQR(((TO-T)**2./((GAMA-1.)*T)) 44100
328      PRINT(III,1)=PD                      44110
329      PRINT(III,2)=P                       44120
330      PRINT(III,3)=T                       44130
331      PRINT(III,4)=U                       44140
332      PRINT(III,5)=AMACH                   44150
333      PRINT(III,6)=ALP                     44160
334      PRINT(III,7)=AP                      44170
335      PRINT(III,9)=WDOT                    44180
336      PRINT(III,10)=DWDOT                  44190
337      PRINT(III,12)=RBZ(III)               44200
338      PRINT(III,13)=TAUZ(III)              44210
339      PRINT(III,14)=RBZTO(III)             44220

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340      PRNT(III,IS)=TAUZTO(III)                      44380
341      IF(SLTFLG.LI.0.0)GO TO 1200                    44390
342      WGPRT=WGPRT+DELTA*DELZ*(APHI+AP)/2.            44400
343      IF(AINCW- SCUR(IIS,1)                          44410
344      940 CONTINUE                                     44420
345      SLTFLG=1.0                                       44430
346      IS1=III                                          44440
347      IF(KDUMP(3))970,970,950                         44450
348      950 CONTINUE                                     44460
349      WRITE(6,960)SLTFLG,IIS,IS1,IS2,AINCX,AINCY,AINCW, 5 44470
      XCUR(IIS,1),SCUR(IIS,2),TSLOTF(IIS),TSLOTA(IIS),III,ZCALC(III)
350      960 FORMAT(1H0,7HSLTFLG=F4.0,2X,4H1IS=I3,2X,4HIS1=I3,2X,4HIS2=I3,2X,6H 44480
      XAINCX=IPE11.4,2X,6HAINCY=IPE11.4,2X,6HAINCW=IPE11.4/1H0,12HSCUR(I 44490
      XS,1)=IPE11.4,2X,12HSCUR(IIS,2)=IPE11.4,2X,12HTSLOTF(IIS)=IPE11.4,2 44500
      XX,12HTSLOTA(IIS)=IPE11.4,2X,6HZCALC(I,13,2H)=IPE11.4) 44510
351      970 IF(SLTFLG-1.0)1040,980,1020                44520
352      980 CONTINUE                                     44530
353      SLTFLG=2.0                                       44540
354      990 IF(SCUR(IIS,1)-AINCY)1010,1000,1000         44550
355      1000 CONTINUE                                    44560
356      RETURN                                           44570
357      1010 HSLOTF=RFY+(RFY-RFX)*(SCUR(IIS,1)-AINCX)/(AINCY-AINCX) 44580
358      SLTFLG=3.0                                       44590
359      GO TO 1040                                       44600
360      1020 IF(SLTFLG-2.0)990,990,1030                44610
361      1030 CONTINUE                                     44620
362      IF(SLTFLG-1.0)1080,1080,1070                   44630
363      1040 IF(ZCALC(III,1)-AINCY)220,220,1050        44640
364      1050 CONTINUE                                     44650
365      IF(AINCY- SCUR(IIS,1)                          44660
366      1060 RETURN                                     44670
367      1070 IF(SLTFLG-4.0)1110,1110,1170              44680
368      1080 IF(SCUR(IIS,2)-AINCY)1100,1090,1090      44690
369      1090 CONTINUE                                     44700
370      RETURN                                           44710
371      1100 HSLOTA=RFY+(RFY-RFX)*(SCUR(IIS,2)-AINCX)/(AINCY-AINCX) 44720
372      SLTFLG=4.0                                       44730
373      1110 IF( SCUR(IIS,2)                            44740
374      1120 CONTINUE                                     44750
375      RETURN                                           44760
376      1130 AINCHI=AINCW                               44770
377      AINCW=SCUR(IIS,2)                               44780
378      SLTFLG=5.0                                       44790
379      DO 1150 I=III,N1                                44800
380      IF(AINCW-ZCALC(I))1160,1150,1150              44810
381      1150 CONTINUE                                     44820
382      1160 P=PD(III)                                   44830
383      IS2=1-1                                          44840
384      III=IS2                                          44850
385      I1J=III                                          44860
386      TAU=TAUZ(III)                                    44870
387      TAUO2=TAUZTO(III)                               44880
388      THOLD=TAU                                         44890
389      TEMP=(AINCW-AINCX)/(AINCY-AINCX)               44900
390      GO TO 290                                         44910

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391	1170	IF(KDUMP(3))1190,1190,1180	44940.
392	1180	CONTINUE	44950
393		WRITE(6,960)SLTFLG,IS,IS1,IS2,AINCX,AINCY,AINCW.	S 44960
		XCUR(IIS,1),SCUR(IIS,2),TSLTF(IIS),TSLTA(IIS),III,ZCALC(III)	44970
394	1190	CALL SLOT(IE)	44980
395		WGPORT=WGPORT+DELTA * (SCUR(IIS-1,2)-SCUR(IIS-1,1))*3.14159*	44990
		X(RFH1**2.+RF**2.)/2.	45000
396		CALL RBSUB	45010.
397		IF(ICHN.EQ.5) RETURN	45020
398		RBZ(III)=RB	45030
399		PRNT(III,11)=DWDTS(IIS-1)	45040
400		GO TO 540	45050
401	1200	SLTFLG=0.0	45060
402		AINCHI=AINCW	45070
403		PRNT(III,10)=DWSLTA(IIS-1)+DWSLTF(IIS-1)	
404		GO TO 240	45090
405	1220	IF(AINCW-HCU)220,1240,1240	45100
406	1210	IF(IE)1250,1220,1250	45110
407	1240	RSLVRN=RSLVRN	45130
408		IE=-1	45140
409	1250	CONTINUE	45150
410		RETURN	45160
411		END	

SYMBOL		REFERENCES	
10	-	40	41*
20	-	40	43*
30	-	44	45*
40	-	47	48*
50	-	50	51*
60	-	57WR	58*
70	-	59WR	60*
80	-	46	47
90	-	61	62*
100	-	44	61
110	-	66	67*
120	-	74	75*
130	-	74	77*
140	-	78	79*
150	-	79	80*
160	-	66	78
170	-	83	84*
180	-	85	86*
190	-	85	87*
200	-	87	88*
210	-	87	90*
220	-	83	94*
230	-	94	95*
240	-	98*	404
250	-	106	107*
260	-	108	109*
270	-	106	113*
280	-	108	113
290	-	113	117*
300	-	136	137*
310	-	136	144*
315	-	145	146*
320	-	145	146
330	-	146	154*
331	-	154	156*
334	-	15700	159*
335	-	160WR	161*
336	-	158	164*
337	-	166	168*
338	-	167	170*
339	-	155	156
340	-	183	184*
350	-	183	186*
360	-	189	190*
370	-	189	192*
380	-	192	193*
390	-	192	195*
400	-	191	194
410	-	143	153
420	-	198	199*
430	-	201*	
440	-	198	203*
450	-	204	205*

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460	-	206WR	207*		
470	-	204	208*		
480	-	209	210*		
490	-	211	212*		
500	-	209	211	215*	
510	-	219	220*		
520	-	223	224*		
530	-	223	226*		
540	-	219	227*	400	
550	-	227	228*		
560	-	229	230*		
570	-	231	232*		
580	-	231	233*		
590	-	234	235*		
600	-	234	241*		
610	-	242	243*		
620	-	24100	244*		
630	-	82	247	245*	
640	-	247	248*		
650	-	247	251*		
660	-	240	250	252*	
670	-	255	256*		
680	-	255	259*		
690	-	259	260*		
700	-	259	264*		
710	-	265	266*		
720	-	26400	267*		
730	-	263	265	268*	
740	-	269	270*		
750	-	269	274*		
760	-	275	276*		
770	-	27800	279*		
780	-	275	280*		
790	-	275	283*		
800	-	258	273	282	284*
810	-	227	229	288*	
820	-	287	291*		
830	-	292	293*		
840	-	296	297*		
850	-	297	298*		
860	-	298WR	299*		
870	-	296	297	300*	
900	-	304*			
910	-	305	306*		
920	-	305	308*		
930	-	291	327*		
940	-	343	344*		
950	-	347	348*		
960	-	349WR	350*	393WR	
970	-	44	292	347	351*
980	-	351	352*		
990	-	354*	360		
1000	-	354	355*		
1010	-	354	357*		
1020	-	351	360*		

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		202	206WR	286	287	290	298WR	328	329	330	331	332	333	334
		335	336	337	338	339	340	346	349WR	363	37900	382	384=	385
		386	387	393WR	399	403								
	IIJ	- 22CO	99=	111=	218	385=	398							
	IIS	- 22CO	68=	108	113	114	343	349WR	354	357	364	368	371	373
		377	393WR	395	399	403								
*	INPUTE	- 6*												
*	INPUTF	- 7*												
*	INPUTG	- 8*												
*	INPUTH	- 9*												
*	INPUTI	- 10*												
*	INPUTJ	- 11*												
*	INPUTK	- 4*												
*	INPUTL	- 5*												
	IS1	- 22CO	346=	349WR	393WR									
	IS2	- 22CO	349WR	383=	384	393WR								
	KDUMP	- 11CO	204	297	347	391								
	KGAM	- 25CO												
	KNOICG	- 10CO												
	KPLANE	- 10CO	15700											
	KRASHH	- 25CO												
	KXHSBH	- 25CO												
	L	- 164=	164=	170	173	174								
*	LPTU	- 80*	212*											
	M	- 261=	267=	275	277	280	298WR							
	N	- 53=	63=	239=	244=	275	27800	280	298WR					
	NAKEND	- 6CO												
	NAKR	- 6CO												
	NAKRST	- 7CO	61	62	63	65								
	NCASE	- 2CO												
	NCASES	- 2CO												
	NCSCOE	- 8CO												
	NCSTR	- 8CO												
	NDISP	- 2CO												
	NDUMX	- 170=	17200	17546										
	NF	- 2CO												
	NGEO	- 5CO	170											
	NGEOMH	- 5CO												
	NGEOMN	- 5CO												
	NI	- 22CO	37900											
	NINCPL	- 22CO												
	NLEWIS	- 2CO												
	NN	- 52=	62=	237AG	249AG	251AG	257AG	268AG	277=	27800	298WR			
	NNN	- 64=	65=	24100	261	26400								
	NPH	- 7CO												
	NRECON	- 2CO	46											
	NSI	- 2CO												
	NSLOT	- 22CO												
	NTABE	- 22CO												
	NTAUTO	- 7CO	55											
	NTEST	- 42=	44	49=										
	NTME	- 22CO	50	52	53	54	59WR	64						
	P	- 23CO	284	285	326	329	382=							
	PA	- 11CO												
*	PARMA	- 21*												

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I N D E X

SUBROUTINE SEG SUB(IE)

PAGE 420

RSLVRY	-	18C0	137	151	179	407								
R2	-	4C0												
R2DM	-	12C0												
R3	-	4C0												
R3DM	-	12C0												
R4	-	4C0												
R4DM	-	12C0												
R5	-	4C0												
R5DM	-	12C0												
R6	-	4C0												
R6DM	-	12C0												
R7	-	4C0												
R7DM	-	12C0												
R8	-	4C0												
R8DM	-	12C0												
SCUR	-	22C0	108	113	114	343	349WR	354	357	365	368	371	373	377
	-	393WR	395											
* SEG SUB	-	1*												
* SLOT	-	394*												
SLTFLG	-	26C0	94	219	291	292	341	345=	349WR	351	353=	358=	360	362
	-	367	372=	378=	393WR	401=								
* SORT	-	327												
STDYST	-	9C0	47											
STFLAG	-	9C0	222	302										
SUMOV	-	20C0												
T	-	23C0	326	327	330									
TAU	-	20C0	101=	103	187=	190	193	211	253	386=	388			
TAUAKR	-	7C0	54	59WR	237AG	242	249AG	251AG	257AG	265	268AG	279	280	
TAUDUM	-	171=	175AG											
TAUHD	-	5C0												
TAUMAX	-	165=	169=	171										
TAUMW	-	13C0	144=	145	146	171	190	193	230	232				
TAUMX	-	31E0	84	86	144	165	189	195						
TAUMY	-	31E0	144	169	192	195								
TAUN	-	5C0												
TAUPL	-	5C0	173											
TAUTO	-	22C0	54=	55=	78	79	87	209	211	227	229	259	262	
TAUTOV	-	21C0												
TAUTOW	-	238=	245=	246=	247	251AG	269	271=	280	281	288WR			
TAUTOX	-	253=	254=	255	259	262=	265	268AG	269	271	280	281	288WR	
TAUTOZ	-	17C0	102=	229	234	242	245	387=						
TAUW	-	4C0	79	211	229	234	242	245						
TAUWDM	-	12C0												
TAUWDP	-	15C0												
TAUWX	-	17C0												
TAUWY	-	17C0												
TAUZ	-	15C0	87	101	171	200=	338	386						
TAUZTO	-	15C0	79	102	202=	340	387							
TBLAKR	-	6C0												
TOMB	-	8C0												
TEMP	-	104=	116=	188=	190	193	195	206WR	389=					
TEMP1	-	309=	310	312=	314=	315=	316=	321						
TEMP2	-	313=	314	317=	319=	320=	321							
TEMP3	-	318=	319											
THOLD	-	13C0	103=	146	185=	187	388=							

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1      SUBROUTINE SETPH(IE)                                70360
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 70810
C      SUBROUTINE SETPH IS THE INTERNAL BALLISTIC SOLUTION CONTROL 70830
C      ROUTINE TO OBTAIN CONVERGENCE ON THE FORE HEAD PRESSURE BY 70840
C      MATCHING THE GRAIN DISCHARGE FLOW WITH THE NOZZLE FLOW DETERMINED 70850
C      FROM THE NOZZLE PRESSURE, THE PERFORMANCE CALCULATIONS FOR THRUST, 70860
C      TOTAL IMPULSE, THRUST COEFFICIENT, ETC., ARE INCLUDED IN 70870
C      SUBROUTINE SETPH (SECTION 4.2). 70880
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 70900
2      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP      ALL
3      COMMON/CONSTS/GNOT,PI,PI02,RADIAN
4      COMMON/INPUT1/AINCIN(18),AND(18),RFI(18),TAUW(18),R2(18),
1          R3(18),R4(18),R5(18),R6(18),R7(18),R8(18),
2          ALS1(18),ALSP(18),ALA(18),ALB(18),ALE(18),AO(18),
3          A02(18),A03(18),A04(18),A05(18)
5      COMMON/INPUTA/RTAOE,DH1,BH,AOHM,RIG,HHR
6      COMMON/INPUTF/NPH,PHST(70),TIMEPH(70),NAKRST,TAUAKR(30),
1          AKRTAU(30),NTAUTO,PCTAB
7      COMMON/INPUTG/CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
1          AMWG(20),TCOMH(20),NCSCOE
8      COMMON/INPUTI/AN2,CM,DE,CT,ANN
9      COMMON/INPUTM/STFLAG,STDYST,DELTST,DELTSS,DELTTO
10     COMMON/INPUTN/CRP,CHT,CRW
11     COMMON/INPUTR/WFACT,RHDTOL,WFTOL
12     COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KDUMP(72)
13     COMMON/WORKA/AINC ,ANODM,RF ,TAUWDM,R2DM,R3DM,R4DM,R5DM,R6DM,
1         R7DM,R8DM,ALS1DM,ALS2DM,ALADM,ALHDM,ALEDM,AW(5)
14     COMMON/WORKKH/RH1(5),HH2,ACG,HHW,VFH0,VCH,ANK(10)
15     COMMON/WORKKN/KN1(8),VFND,VCN,ACK(10)
16     COMMON/DUMYO/ALAMN,CFC,CODET,DELLP,DISH,EPS,FX,PHMAX,PHOLD,
1         PHX,PONX,PSOPQ,TSS,TX,WDB,WDOTX
17     COMMON/CUMA/DELT,APHI,WDOTI,ANIHO,TIME#,UT,ANLOPS,ACCEL,
1         ABCYL,PKNT(101,15),AINCHI,AMACH,ZCALC(101)
18     COMMON/COMB/AMH,AJPHN,AJBNH,TAUAO,AJPHEN,AJBHEO,AJPN07,AJBV07,
1         XDH,XBN,DTINT
19     COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RBZTO(101),PU(101),
1         TAUWDP(101),RB,VF,DWDOT,VP
20     COMMON/COMH/TAUT07,RSLVRN,AX(45),AY(45),AINCX,ANCX,RFX,TAUWX,
1         DUMX(17),AINCX,ANDY,RFY,TAUWY,DUMY(17),VFPP
21     COMMON/COMW/DV,AEE,PEP01
22     COMMON/PARM/AF,PMIN,PMAX,WDOT,III,IIJ,WDOTD,NSLOT,NTAHE,NTHE,
1         TAUTO,TOFLAG,NINCPL,BRNOUT,IIS,ISI,IS2,NI,SCUR(18,2)
23     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,POV,OIS,AMPN,AT,
1         AMW,AKRST
24     COMMON/PARMG/VFH,AAN,VFN,VIS,AIT,SPHDT,SPUNDT,VFINT,VEH,AHTOT
25     COMMON/PARMH/BIE,BOE,AANN,BX,RXX,AS1,DELLRI,ROPE4,AIE,YPI,ZP1,
1         ARCO,ARCI,ROE1,ALITTL,ZI,AIG,THRI,THRU,AOE
26     COMMON/PARMK/F,EP1,PEP0,CFOI,VFWEB,WD,DEED,CLOPS,CFO,WGTOT,
1         SWDOTN
27     COMMON/PARMS/ICHN
28     COMMON/PARMU/ANI
29     COMMON/PARMV/WF
30     COMMON/PARMW/WGPORT
31     COMMON/PARMX/WFI,EP6
32     COMMON/PARMAA/TO,IFLAG

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I N D E X

SUBROUTINE SETPH(IE)

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33      DATA PEPOX1,PEPOY1,E1/3*0.0/
34      IF(IE.EQ.2)GO TO 950
35      IE=0
36      IF(UE-DT)10,20,20
37      10  UE=DT
38      20  AEF=PI*DE**2/4.
39      30  DTINT=DT
40      40  AN2=PI*AN2/180.
41      70  AT=PI*DT**2./4.
42      80  ALAMN=.5+.5*COS(AN2)
43      AEE=PI*DE**2/4.
44      TIMEW=9.999999E35
45      CODET=0.
46      AN180=0.
47      VIS=0.
48      AIT=0.
49      SPHOT=0.
50      SPONDT=0.
51      SWDUTN=0.0
52      FX=0.
53      PHX=0.
54      PONX=0.
55      TX=DELF*VF
56      WDOIX=0.0
57      PHMAX=0.
58      CLOPS=0.
59      WD=0.
60      DEFU=0.
61      PHOLD=0.
62      VFINT=VF
63      VFPP=VCH+VCN
64      KFX=RFI(1)
65      AINCX=AINCIN(1)
66      DO 100 I=2,18
67      AINC=AINCIN(I)
68      KF=RFI(I)
69      CALL VFPPSR(IER)
70      IF(IER.NE.0) GO TO 180
71      100 CONTINUE
72      IF(STFLAG.LE.0.0 .OR. TIME.GE.DELT) GO TO 196
73      195 IF(PH-(0.5*PHI))600,600,200
74      196 IF(PH-PA)600,600,200
75      200 DELLP=PH-PHOLD
76      PHOLD=PH
77      CEMPC=CSTAR
78      ISS=SQRT(2.*GAMA*TO*R*GNOT/(GAMA-1.))
79      GP1=GAMA+1.
80      GM1=GP1-2.
81      AMBSS=SQRT(GAMA*GNOT*(2./GP1)**(GP1/GM1)/(TO*R))
82      CFC=SQRT(2.*GAMA**2*(2./GP1)**(GP1/GM1)/GM1)
83      AMBSU=SQRT(2.*GAMA*GNOT/(TO*R*GM1))
84      EXP1=GAMA/GM1
85      PSOPD=(2./GP1)**EXP1
86      PON=P*(TO/T)**(GAMA/(GAMA-1.))
87

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71800
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88      CLOPS=CLOPS+1.                                71900
89      IF (STFLAG.GT.0.0 .AND. PON.LE.(0.5*PHI) .AND. TIME
      1 .LT. DELT) GO TO 570
90      IF (PON=PA) 570,570,210                        71910
91      210      AMBS=GNUT/CLSTAR                        71920
92      220      DIS=AMBS*ANN*AT*PON                    71930
93      IF (PON*PSOPO=PA) 240,230,230                  71940
94      230      CODET=0.0
95      GO TO 330
96      240      SDIS=ANN*PON*AMBSU*AAE*(PA/PON)**(1./GAMA)*SQRT(1.-(PA/PON)**(1./GAMA))
      XA=1./GAMA))
97      IF (SDIS-DIS) 250,230,230                        71970
98      250      DIS=SDIS                                71980
99      CODET=1.                                          71990
100     GO TO 330                                         72000
101     260     IF (PMAX/1000000.-ABS(PMIN-PMAX)) 370,370,210 72010
102     270     IF (AMPN=0.9) 590,280,280                72020
103     280     ATMAX=CEMPC*WDOT/(GNUT*PON)              72030
104     WRITE(6,290)AT,ATMAX                             72040
105     290     FORMAT(4H0AT=,1PE15.7,63H.THROAT AREA GREATER THAN MAXIMUM ALLOWAN
      XLE THROAT AREA. ATMAX=,1PE15.7)
106     WRITE(6,300)WDOT,DIS,ANLOPS,PON,PA,PMIN,PMAX,AMPN 72050
107     300     FORMAT(6HWDOT=1PE14.7,6H DIS=1PE14.7,9H ANLOPS=1PE14.7,
      X6H PON=1PE14.7,5H PA=1PE14.7,7H PMIN=1PE14.7,7H PMAX=1PE14.7,
      X7H AMPN=1PE14.7)
108     ICHN=5                                             72060
109     RETURN                                             72070
110     310     CONTINUE
111     IF (ANLOPS=20.) 370,370,320                        72100
112     320     IF (STFLAG.GE.0.0 .AND. TIME.LT.DELT) GO TO 325
113     325     IF (0.01-ABS(PON-PA)) 260,600,600
114     IF (0.01-ABS(PON-0.5*PHI)) 260,600,600
115     330     IF (TIME) 350,340,350                    72110
116     340     TEMPI=WDOT/1000.                          72120
117     GO TO 360                                          72130
118     350     TEMPI=(VFINT-VF)*DELF/(TIME*1000.)       72140
119     360     IF (ABS((WDOT-DIS)/DIS)- CRW ) 590,590,310 72150
120     370     IF (STFLAG) 410,410,380                  72160
121     380     CONTINUE
122     IF (NRECON.GT.0) GO TO 400
123     IF (NPH=1) 410,410,390                            72170
124     390     CONTINUE
125     IF (TIME-TIMEPH(NPH)) 400,400,410
126     400     CONTINUE
127     CALL CONV
128     GO TO 560
129     410     IF (CLOPS=1.) 420,430,420
130     420     WD=(WDOT-WDB)/DELLP
131     DEED=(DIS-DISB)/DELLP
132     430     IF (DEED=WD) 450,440,450
133     440     DELLP=PH*((WDOT/DIS)**1.4-1.)
134     GO TO 460
135     450     DELLP=(WDOT-DIS)/(DEED=WD)
136     460     WDB=WDOT
137     DISB=DIS

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I N D E X

SUBROUTINE SETPH(IE)

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138		IF(WDOT-DIS)480,480,470	72410
139	470	PMIN=PH	72420
140		GO TO 490	72430
141	480	PMAX=PH	72440
142	490	TEMP6=PH	72450
143		PH=PH+DELLP	72460
144		IF (PH-PMIN)500,500,530	72470
145	500	IF (PMIN)520,510,520	72480
146	510	PH = 5.	72490
147		GO TO 530	72500
148	520	PH = 2.*PMIN	72510
149	530	IF (PH-PMAX)550,540,540	72520
150	540	PH=(PMAX-PMIN)*0.9+PMIN	72530
151	550	DELLP=PH-TEMP6	72540
152	560	IE=1	72550
153		GO TO 950	72560
154	570	PMIN=PH	72570
155		TEMP6=PH	72580
156		DELLP=PA/3.	72590
157		PH=PH+DELLP	72600
158		IF (PH-PMAX)560,580,580	72610
159	580	PH=(PH-DELLP)*0.1+0.9*PMAX	72620
160		DELLP=PH-TEMP6	72630
161		GO TO 560	72640
162	590	PMIN=PA	72650
163		CLOPS=0.	72660
164		PMAX=9.9999999E35	72670
165		GO TO 610	72680
166	600	PH=PA	72690
167		PON=PA	72700
168		IF (STFLAG.GT.0.0) PH=0.5*PHI	
169		IF (STFLAG.GT.0.0) PON=0.5*PHI	
170		AMPN=0.	72710
171		F=0.	72720
172		GO TO 800	72730
173	610	AEE=PI*DE**2/4.	72740
174		IF (CODET)790,620,790	72750
175	620	EPG=AEE/AT	72760
176		IF (PA)630,660,630	72770
177	630	EPS=0.609*(PON/PA)**0.814	72780
178		IF (EPS-1.)640,640,650	72790
179	640	EP1=1.	72800
180		PEPO=PSOPO	72810
181		GO TO 780	72820
182	650	IF (EPG-EPS)660,660,670	72830
183	660	EP1=EPG	72840
184		GO TO 680	72850
185	670	EP1=EPS	72860
186	680	GM1=GAMA*1.	
187		GP1=GAMA*1.	72890
188	690	TEMP1=((GM1/GP1)**.5*(2./GP1)**(1./GM1))/EP1	72900
189		PEP01=0.01	72910
190		IFLAG=1	72920
191		ITER=0	72930
192		GO TO 710	72940

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193 700 PEP01=.002 72950
194 IFLAG=2 72960
195 710 PEP0X2=PEP0X1 72970
196 PEP0X1=PEP01 72980
197 PEP0Y=(TEMP1/SQRT(1.0-(PEP01)**(GM1/GAMA)))*GAMA 72990
198 PEP0Y2=PEP0Y1 73000
199 PEP0Y1=PEP0Y 73010
200 E2=E1 73020
201 E1=(PEP0X1-PEP0Y1)/PEP0X1 73030
202 ITER=ITER+1 73040
203 IF(IFLAG-1)/00,700,720 73050
204 720 CONTINUE 73060
205 IF(ITER-30)/50,750,730 73070
206 730 CONTINUE 73080
207 WRITE(6,740)PEP0X1,PEP0X2,PEP0Y1,PEP0Y2,E1,E2 73090
208 740 FORMAT(1X,99HITERATION FOR NOZZLE PRESSURE RATIO IN SUBROUTINE SET 73100
XPH HAS FAILED. EXECUTION HAS BEEN TERMINATED./1X,7HP0X1=1PE11.4 73110
X,2X,7HP0X2=1PE11.4,2X,7HP0Y1=1PE11.4,2X,7HP0Y2=1PE11.4,2X,3H 73120
XE1=1PE11.4,2X,3HE2=1PE11.4) 73130
209 ICHN=5 73140
210 RETURN 73150
211 750 IF(ABS(E1)-0.001)/770,770,760 73160
212 760 CONTINUE 73170
213 PEP01=(E2*PEP0X1-E1*PEP0X2)/(E2-E1) 73180
214 PEP01=AMIN1(PEP01,1.0) 73190
215 PEP01=AMAX1(PEP01,1.E-5) 73200
216 GO TO 710 73210
217 770 PEP0=PEP0Y 73220
218 CFO=CFC*SQRT(1.-PEP0**GM1/GAMA) 73230
219 780 CFOL=(CFO*ALAMN+PEP0*EPI)*CM 73240
220 F=(CFOL*PON*AT-PA*EPI*AT)*ANN 73250
221 GO TO 800 73260
222 790 VE=ISS*SQRT(1.-(PA/PON)**(GM1/GAMA)) 73270
223 F=VE*ALAMN*WDOT*CM*ANN/GNOT 73280
224 800 WF=UELF*VF 73290
C
C PROPELLANT MASS CORRELATION
C
225 IF(TIME.GT.0.0) GO TO 809
226 IF(WFACT.EQ.0.0) GO TO 809
227 DELWF = ABS(WF-WFACT)
228 IF((DELWF/WFACT).GT.0.05) GO TO 801
229 GO TO 803
230 801 WRITE(6,802) WFACT,WF
231 802 FORMAT(10CASE TERMINATED, CALCULATED TOTAL PROPELLANT MASS UNREASON-
INABLE-CHECK INPUT DATA./10INPUT MASS =1.F11.2,5X,CALCULATED MASS
2=1.F11.2)
232 STOP
233 803 IF((DELWF/WFACT).LT.WFTOL) GO TO 809
234 IF(RHOTOL.GT.0.0) GO TO 805
235 WRITE(6,804) WFACT,WF
236 804 FORMAT(10PROPELLANT MASS DIFFERENCE IS SIGNIFICANT-ADJUST WITH DEN-
SITY AND/OR DIMENSION INPUT DATA-CASE TERMINATED./10INPUT MASS =1.
2F11.2,5X,CALCULATED MASS =1.F11.2)
237 STOP

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238      805 DELFX = DELF
239          DELF = DELFX * WFACT/WF
240          IF (ABS((DELF-DELFX)/DELFX).LT.RHOTOL) GO TO 807
241          WRITE(6,806) WFACT,WF
242      806 FORMAT('0PROPELLANT MASS DIFFERENCE IS SIGNIFICANT. HOWEVER, ADJUSTMENT IN DENSITY EXCEEDS RHOTOL// READJUST WITH DENSITY AND/OR DIMENSION INPUT DATA - CASE TERMINATED//0INPUT MASS =',F11.2,5X,3'CALCULATED MASS =',F11.2)
243          STOP
244      807 WRITE(6,808) DELF
245      808 FORMAT('//0INPUT DENSITY WAS ADJUSTED. ADJUSTED DENSITY =',F9.6)
246          WF = DELF * VF
247      809 IF (TIME.EQ.0.0) WFI=WF
248          TEMP1=TX-WF
249      830 IF (PHMAX-PHOLD) 840,840,850
250      840 PHMAX=PHOLD
251      850 IF (TIME.NE.0.0) GO TO 852
252          AIT=0.0
253          SPNDT=0.0
254          SPOND1=0.0
255          SWDOTN=0.0
256          GO TO 853
257      852 SPNDT=SPNDT+(PHOLD-PHX)*DELT/2.
258          SPOND1=SPOND1+(PON-PONX)*DELT/2.
259          SWDOTN=SWDOTN+(WDOTX+WDOT)*DELT/2.
260          AIT=AIT+(F+FX)*DELT/2.
261      453 FX=F
262          PONX=PON
263          PHX=PHOLD
264          IF (TIME.LT.DELT .AND. STFLAG.GT.0.0) PHX=0.5*PHI
265          TX=WF
266          WDOTX=WDOT
267          WGTOT=WGPORT+(VCH-VFH)*P/(12.*R*TO)+(VCN-VFN)*P/(12.*R*TO)
268          IF (TIME) 870,880,870
269      870 IF (TIME-TIMEW) 950,880,950
270      880 VFWEV=VF
271      950 IF (KDUMP(3)) 980,980,960
272      960 CONTINUE
273          WRITE(6,970) PHOLD,WDOT,WDR,DELLP,PMIN,WDCLOPS.
274      970 FORMAT('//1H 36HFORE HEAD PRESSURE ITERATION SUMMARY//1H PHOLD=1P
275          XE10.3,2X,5HWDDT=1PE10.3,3X,4HWDB=1PE10.3,4X,6HDELLP=1PE10.3,2X,5HP
276          XMIN=1PE10.3,3X,3HWD=1PE10.3,5X,6HCLOPS=1PE10.3/5H PON=1PE10.3,4X,4
275          XHDS=1PE10.3,4X,5HDSB=1PE10.3,3X,5HDEEU=1PE10.3,3X,5HPMAX=1PE10.3
276          X,3X,3HPPH=1PE10.3,5X,7HANLOPS=1PE10.3)
275      980 RETURN
276          END

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73690

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73710

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73730

73740

SYMBOL	-----	REFERENCES	-----
10	-	36	37*
20	-	36	38*
30	-	39	40*
70	-	42*	
80	-	43*	
100	-	6700	72*
180	-	39	71 73*
195	-	74*	
196	-	73	75*
200	-	74	75 76*
210	-	90	91*
220	-	92*	
230	-	93	94* 97
240	-	93	96*
250	-	97	98*
260	-	101*	113 114
270	-	101	102*
280	-	102	103*
290	-	104WR	105*
300	-	106WR	107*
310	-	110*	119
320	-	111	112*
322	-	113*	
325	-	112	114*
330	-	95	100 115*
340	-	115	116*
350	-	115	118*
360	-	117	119*
370	-	101	111 120*
380	-	120	121*
390	-	123	124*
400	-	122	125 126*
410	-	120	123 125 129*
420	-	129	130*
430	-	129	132*
440	-	132	133*
450	-	132	135*
460	-	134	136*
470	-	138	139*
480	-	138	141*
490	-	140	142*
500	-	144	145*
510	-	145	146*
520	-	145	148*
530	-	144	147 149*
540	-	149	150*
550	-	149	151*
560	-	128	152* 156 161
570	-	89	90 154*
580	-	158	159*
590	-	102	119 162*
600	-	74	75 113 114 166*
610	-	165	173*

I N D E X

SUBROUTINE SETPH(IE)

PAGE 429

620	-	174	175*						
630	-	176	177*						
640	-	178	179*						
650	-	178	182*						
660	-	176	182	183*					
670	-	182	185*						
680	-	184	186*						
690	-	188*							
700	-	193*	203						
710	-	192	195*	216					
720	-	203	204*						
730	-	205	206*						
740	-	207WR	208*						
750	-	205	211*						
760	-	211	212*						
770	-	211	217*						
780	-	181	219*						
790	-	174	222*						
800	-	172	221	224*					
801	-	228	230*						
802	-	230WR	231*						
803	-	229	233*						
804	-	235WR	236*						
805	-	234	238*						
806	-	241WR	242*						
807	-	240	244*						
808	-	244WR	245*						
809	-	225	226	233	247*				
830	-	249*							
840	-	249	250*						
850	-	249	251*						
852	-	251	257*						
853	-	256	261*						
870	-	268	269*						
880	-	268	269	270*					
950	-	34	153	269	271*				
960	-	271	272*						
970	-	273WR	274*						
980	-	271	275*						
AAN	-	24CO							
AANN	-	25CO							
ABCYL	-	17CO							
ABS	-	101	113	114	119	211	227	240	
ABTOT	-	24CO							
ACCEL	-	17CO							
ACG	-	14CO							
ACK	-	15CO							
AEE	-	21CO	38=	44=	96	173=	175		
AHH	-	18CO							
AIG	-	25CO							
AINC	-	13CO	68=						
AINCHI	-	17CO							
AINCIN	-	4CO	66	68					
AINCW	-	23CO							
AINCX	-	20CO	66=						

I N D E X

SUBROUTINE SETPH(IE)

PAGE 430

AENCY	-	20C0					
AIT	-	24C0	49=	252=	260=		
AJBHED	-	18C0					
AJBHN	-	18C0					
AJBNOZ	-	18C0					
AJPHEO	-	18C0					
AJPHN	-	18C0					
AJPNOZ	-	18C0					
AKGY	-	23C0					
AKRST	-	23C0					
AKRTAU	-	6C0					
ALA	-	4C0					
ALADM	-	13C0					
ALAMN	-	16C0	43=	219	223		
ALB	-	4C0					
ALBUM	-	13C0					
ALE	-	4C0					
ALEDM	-	13C0					
ALITIL	-	25C0					
ALS1	-	4C0					
ALS1UM	-	13C0					
ALS2	-	4C0					
ALS2UM	-	13C0					
AMACH	-	17C0					
AMAX1	-	215					
AMHSS	-	82=	91=	92			
AMHSU	-	84=	96				
AMIN1	-	214					
AMPN	-	23C0	102	106WR	170=		
AMW	-	23C0					
AMWG	-	7C0					
ANI	-	28C0					
ANI80	-	17C0	47=				
ANK	-	14C0					
ANLOPS	-	17C0	106WR	111	273WR		
ANN	-	8C0	92	96	220	223	
ANU	-	4C0					
ANUDM	-	13C0					
ANOX	-	20C0					
ANOY	-	20C0					
AN2	-	8C0	41=	43			
AUE	-	25C0					
AOHM	-	5C0					
AQ1	-	4C0					
AQ2	-	4C0					
AQ3	-	4C0					
AQ4	-	4C0					
AQ5	-	4C0					
AP	-	22C0					
APHI	-	17C0					
ARCO	-	25C0					
ARC1	-	25C0					
AS11	-	25C0					
AT	-	23C0	42=	92	104WR	175	220
ATMAX	-	103=	104WR				

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I N D E X

SUBROUTINE SETPH(IE)

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PA	-	12CO	75	90	93	96	106WR	113	156	162	166	167	176	177
		220	222											
* PARMAA	-	32*												
* PARMB	-	22*												
* PARMF	-	23*												
* PARMG	-	24*												
* PARMH	-	25*												
* PARMK	-	26*												
* PARMS	-	27*												
* PARMU	-	28*												
* PARMV	-	29*												
* PARMW	-	30*												
* PARMX	-	31*												
PCTAB	-	6CO												
PD	-	19CO												
PEPO	-	26CO	180=	217=	218	219								
PEPDX1	-	33DA	195	196=	201	207WR	213							
PEPDX2	-	195=	207WR	213										
PEPOY	-	197=	199	217										
PEPOY1	-	33DA	198	199=	201	207WR								
PEPOY2	-	198=	207WR											
PEPO1	-	21CO	169=	193=	196	197	213=	214=	215=					
PH	-	23CO	74	75	76	77	133	139	141	142	143=	144	145=	148=
		149	150=	151	154	155	157=	158	159=	160	166=	168=	267	273WR
PHI	-	12CO	74	89	114	168	169	264						
PHMAX	-	16CO	58=	249	250=									
PHOLD	-	16CO	62=	76	77=	249	250	257	263	273WR				
PHST	-	6CO												
PHX	-	16CO	54=	257	263=	264=								
PI	-	3CO	38	41	42	44	173							
PI02	-	3CO												
PMAX	-	22CO	101	106WR	141=	149	150	158	159	164=	273WR			
PMIN	-	22CO	101	106WR	139=	144	145	148	150	154=	162=	273WR		
PON	-	23CO	87=	89	90	92	93	96	103	106WR	113	114	167=	169=
		177	220	222	258	262	273WR							
PONX	-	16CO	55=	258	262=									
PRESS	-	7CO												
PRNT	-	17CO												
PSOPO	-	16CO	66=	93	180									
R	-	7CO	79	82	84	267								
RADIAN	-	3CO												
RB	-	19CO												
RBZ	-	19CO												
RBZTO	-	19CO												
* RETURN	-	109*	210*	275*										
RF	-	13CO	69=											
RF1	-	4CO	65	69										
RFX	-	20CO	65=											
RFY	-	20CO												
RHUTOL	-	11CO	234	240										
RH1	-	14CO												
RIG	-	5CO												
RN1	-	15CO												
ROE1	-	25CO												
ROPE4	-	25CO												

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I N D E X

SUBROUTINE SETPH(IE)

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VEH	-	24CO																
VF	-	19CO	56	63	118	224	246	270										
VFH	-	24CO	267															
VFHO	-	14CO																
VFINT	-	24CO	63=	118														
VFN	-	24CO	267															
VFNO	-	15CO																
VFPP	-	20CO	64=															
* VFPPSH	-	70*																
VFWEB	-	26CO	270=															
VIS	-	24CO	48=															
VP	-	19CO																
WD	-	26CO	60=	130=	132	135	273WR											
WDB	-	16CO	130	136=	273WR													
WDOT	-	22CO	103	106WR	116	119	130	133	135	136	138	223	259	266				
		273WR																
WDOTU	-	22CO																
WDOTI	-	17CO																
WOUTX	-	16CO	51=	259	266=													
WF	-	29CO	224=	227	230WR	235WR	239	241WR	246=	247	248	265						
WFACT	-	11CO	226	227	228	230WR	233	235WR	239	241WR								
WFI	-	31CO	247=															
WFTOL	-	11CO	233															
WGPORT	-	30CO	267															
WGTOT	-	26CO	267=															
* WORKA	-	13*																
* WORKKH	-	14*																
* WORKRN	-	15*																
XBH	-	18CO																
XBN	-	18CO																
YPI	-	25CO																
ZCALC	-	17CO																
ZI	-	25CO																
ZPI	-	25CO																

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1      SUBROUTINE SLOT(IE)
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
C      SUBROUTINE SLOT DETERMINES THE GAS PROPERTIES AT THE DISCHARGE
C      SECTION OF A SLOT BETWEEN GRAIN SEGMENTS FOR THE NON-STEADY FLOW
C      OF THE INTERNAL BALLISTICS (SECTION 4.1.2.2).
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC
2      COMMON/CONSTS/GNDT,PI,PI32,RADIAN
3      COMMON/INPUTG/CSTAR,GAMA,R,NCSTR,PRESS(20),CSTR(20),GAMAG(20),
1      A4WG(20),TCOMB(20),NCSCOE
4      COMMON/INPUTM/STFLAG,STOYST,DELST,DELTS,DELTT
5      COMMON/INPUTT/S9(18),SLTFRN(18),SA(18)
6      COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KDUMP(72)
7      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1      ALS1,ALS2,ALA,ALB,ALE,AW(5)
8      COMMON/COMA/DELT,APHI,WDOTI,ANIR0,TIMEW,UT,ANLOPS,ACCEL,
1      ABCYL,PRNT(101,15),AINCHI,AMACH,ZCALC(101)
9      COMMON/CUMG/TAUZ(101),RSZ(101),TAUZTO(101),RBZTO(101),PD(101),
1      TAUWDP(101),R8,VF,DWDOT,VP
10     COMMON/COMJ/ABSLTA(18),ABSLTF(18),APA(18),APF(18),PSA(18),
1      PSF(18),POA(18),POF(18),ISA(18),TSF(18),UA(18),
2      UF(18),WSLOTJ(18),WSLOTI(18)
11     COMMON/CUMK/DWSLTA(18),DWSLTF(18),DWDTS(18),AFH1,RHSLTA(18),
1      RBSLTF(18),TSLOTA(18),TSLOTF(18)
12     COMMON/CUMQ/THSLV,THSLVD,THSLVV,ASLVR,AHO,RPHI,ALPX,APX,
1      RBHI,ALPY,APY,VSLVR
13     COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARH,ASE,AFF,WI,WT,RA,
1      RAO,ALL,AJPP,AST
14     COMMON/PARM6/AP,PMIN,PMAX,WDOT,III,IJJ,WDOTD,NSLOT,NTAD,NTME,
1      TAUTO,TOFLAG,NINCP,BRNOUT,IIS,ISI,IS2,NI,SCUR(18,2)
15     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
1      AMW,AKNST
16     COMMON/PARMR/RBSLOT,RSLOTA,RSLOTF,SLTFLG
17     COMMON/PARMS/ICHN
18     COMMON/PARMY/PSAPR(18),PSFPR(18)
19     COMMON/PARMZ/ABSL0T,PD
20     COMMON/PARM4A/TO,IFLAG
21     DATA TX1,TY1,TE1,PDX1,PDY1,E1/6*0.0/
22     UOPS=0.0
23     IF((STFLAG.LE.0.0).OR.(TIME.LT.0ELT))DWDOT=0.0
24     IF(STFLAG)0,10.5
25     5 IF(TIME)6,6,30
26     6 PD(1S1)=0.5*PHI
27     PD(1S2)=0.5*PHI
28     PSA(1IS)=0.5*PHI
29     PSF(1IS)=0.5*PHI
30     POF(1IS)=0.5*PHI
31     POA(1IS)=0.5*PHI
32     GO TO 25
33     10 IF(PD(1S1)-PA)20,20,30
34     20 PD(1S1)=PA
35     PD(1S2)=PA
36     PSA(1IS)=PA
37     PSF(1IS)=PA
38     POF(1IS)=PA
39     POA(1IS)=PA

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ORIGINAL PAGE IS
OF POOR QUALITY

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40      25 APF(IIS)=PI*RFHI**2
41      ABSLTF(IIS)=AFHI
42      WDOTSD=0.0
43      TS=TO
44      UTMP=0.0
45      WDOTD=0.0
46      WDOTSI=0.0
47      WSLOTI(IIS)=0.0
48      GO TO 410
49      30 P=PD(IS1)
50      CALL RH5UB
51      WDOTD=WDOT
52      IF(SLTHRN(IIS).EQ.1..OR.SLTHRN(IIS).EQ.3.)RH5LOT=0.0
53      RH5LTF(IIS)=RH5LOT
54      DWSLTF(IIS)=RH5LOT*DELF*AFHI
55      WDOTSI=WDOTD*DWSLTF(IIS)
56      WSLUTI(IIS)=WDOTSI
57      POF(IIS)=PO
58      PSF(IIS)=PD(IS1)
59      PBAR=PSF(IIS)
60      UF(IIS)=WDOTSI*R*T/(PI*RFHI**2.*PD(IS1))
61      AMACH=ABS(U)/SQRT(GNOT*GAMA*R**1)
62      QVDI=(TSLOTF(IIS)*(RFHI**2.+RSLOTF**2.)+TSLOTA(IIS)*
        X(RF**2.+RSLOTA**2.))*PI/(2.*DELT)
63      V=(SCUR(IIS,2)-SCUR(IIS,1))*(RF**2.+RFHI**2.)*PI/2.
64      APF(IIS)=PI*RFHI**2.
65      ABSLTF(IIS)=AFHI
66      IF(SLTHRN(IIS).EQ.1..OR.SLTHRN(IIS).EQ.3.)ABSLTF(IIS)=0.0
67      AMSQ=AMACH**2.
68      IF(AMACH.EQ. 0.0 ) GO TO 32
69      DP=PD(IS1)*DWSLTF(IIS)*4.*GAMA*AMSQ*(1.+(GAMA-1.)*AMSQ/2.)*
        XZERUDV(WDOT*(1.-AMSQ))
70      DT=TSF(IIS)*(GAMA-1.)*(1.+GAMA*AMSQ)*AMSQ*2.*DWSLTF(IIS)*
        XZERUDV((1.-AMSQ)*WDOT)
71      GO TO 34
72      32 DP = 0.0
73      DT = 0.0
74      34 CONTINUE
75      PD(IS2) = PD(IS1) - DP
76      TSF(IIS)=T
77      TS=TSF(IIS)
78      UMAX=SQRT(2.*GAMA*R*GNOT*TO/(GAMA-1.))
79      ITER=0
80      40 IF(ITER-1)50,60,70
81      50 TS=TSF(IIS)-DT
82      GO TO 70
83      60 TS = TSF(IIS) - DT
84      70 TX2=TX1
85      TX1=TS
86      DP=PD(IS1)-PD(IS2)
87      ICOUNT=0
88      80 IF(ICOUNT-1)90,100,110
89      90 PSA(IIS)=PD(IS1)-DP/2.
90      GO TO 110
91      100 PSA(IIS)=PD(IS1)-DP

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92      110  PDX2=PDX1                      98640
93      PDX1=PSA(IIS)                      98650
94      P=PSA(IIS)                         98660
95      CALL RHSUB                          98670
96      IF (SLTHRN(IIS).EQ.2..OR.SLTHRN(IIS).EQ.3.) RHSLOT=0.0
97      DWSLTA(IIS)=RHSLOT*DELF*AFF          98690
98      RHSLTA(IIS)=RHSLOT                  98690
99      IF (STFLAG) 120,120,150             98700
100     120  WDOTD=WDOTSI+DWSLTA(IIS)        98710
101     WDOTSD=WDOTD                         98720
102     UTMP=WDOTD*R*TS*ZERODV(PSA(IIS)*AP)
103     UTMP=AMIN1(UTMP,UMAX)                98740
104     IF (WDOTD) 130,130,140               98750
105     130  WDOTD=0.0                       98760
106     UTMP=0.0                             98770
107     140  XMBAR=0.5*(U/SORT(GNOT*R*GAMA*TSF(IIS))+
      *   UTMP/SORT(GNOT*R*GAMA*TS))
108     PDY=PSF(IIS)+WDOT/GNOT*U/APHI-WDOTD/GNOT*UTMP/AP-
      *   2.0*GAMA*PBAR*XMBAR**2*(AP-APHI)/(AP+APHI)
109     PHAR=0.5*(PSF(IIS)+PDY)
110     DP = PSF(IIS) - PDY
111     GO TO 190                             98800
112     150  DWDI=(PSF(IIS)+PSA(IIS))*DWDI/(12.*R*(TSF(IIS)+TSA(IIS)))+V*
      X(PSF(IIS)+PSA(IIS)-PSFPR(IIS)-PSAPR(IIS))/(12.*R
      X*(TSF(IIS)+TSA(IIS))*DELT)          98820
113     WDOTSD=WDOTSI-DWDI                  98840
114     WDOTD=WDOTSD+DWSLTA(IIS)            98850
115     IF (WDOTD) 160,160,170              98860
116     160  WDOTD=0.0                       98870
117     UTMP=0.0                             98880
118     GO TO 180                             98890
119     170  UTMP=WDOTD*R*TS*ZERODV(PSA(IIS)*AP) 98900
120     UTMP=AMIN1(UTMP,UMAX)                98910
121     180  PDY=(WDOT*U/GNOT-WDOTD*UTMP/GNOT+PSF(IIS)*APHI+(PSF(IIS)
      X+PSA(IIS))*(AP-APHI)/2.-((PSF(IIS)+PSA(IIS))*(U+UTMP)*DWDI)/(48.*
      XGNOT*R*TS))/AP                      98920
122     PDY=PDY-(V*(U+UTMP)*(PSF(IIS)+PSA(IIS)-PSFPR(IIS)-PSAPR(IIS))/
      X(48.*GNOT*R*TS*DELT))/AP           98930
123     190  IF (ACCEL) 200,200,210          98940
124     200  TEMPA=0.0                       98950
125     GO TO 220                             98960
126     210  TEMPA=((PSF(IIS)+PSA(IIS))*(AP+APHI)*ACCEL*(A1NCW-A1NCHI))/
      X(48.*R*TS*AP)                      98970
127     220  PDY=PDY+TEMPA                  98980
128     PDY2=PDY1                             98990
129     PDY1=PDY                             99000
130     E2=E1                                99010
131     E1=(PDX1-PDY1)*ZERODV(PDX1)          99020
132     ICOUNT=ICOUNT+1                      99030
133     IF (ICOUNT-2) 100,230,230            99040
134     230  IF (ICOUNT-2) 260,260,240        99050
135     240  WRITE(6,250) IIS,PDX1,PDX2,PDY1,PDY2,E1,E2 99060
136     250  FORMAT(4H0 ITERATION FOR DISCHARGE PRESSURE OF SLOT ,I2,11H4S FAI
      XLED./1H0,10X,7HPDX1 = E20.7/1H0,10X,7HPDX2 = E20.7/1H0,10X,7HPDY1 = E2
      X0.7,10X,7HPDY2 = E20.7/1H0,10X,7HE1 = E20.7,10X,7HE2 = E20.7) 99110

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137      ICHN=5
138      IE=2
139      RETURN
140      260 IF (KDUMP(3)) 290,290,270
141      270 WRITE(6,280) ICOUNT,PSA(IIS),PDY,WDOTD,PDX2,PDY2,E1,E2
142      280 FORMAT(2X,7HICOUNT=I2,2X,3HPD=IPE11.4,2X,4HPDY=IPE11.4,2X,6HWDOTD=
X1PE11.4,2X,5HPDX2=IPE11.4,2X,5HPDY2=IPE11.4,2X,3HE1=IPE11.4,2X,3HE
X2=IPE11.4//)
143      290 IF (ABS(E1)-.001) 310,310,300
144      300 PSA(IIS)=(E2*PDX1-E1*PDX2)*ZERODV(E2-E1)
145      GO TO 80
146      310 PSA(IIS)=PDY
147      PD(IS2) = PSA(IIS)
148      TS      = TO - (GAMA - 1.0)*UTMP**2/(2.0*GNOT*GAMA*R)
149      320 UTMP  = WDOTD*R/AP*TS/PD(IS2)
150      OT      = TSF(IIS) - TS
151      TY2     = TY1
152      TY1     = TS
153      TE2=TE1
154      TE1=(TX1-TY1)/TX1
155      ITER=ITER+1
156      IF (ITER-2) 60,330,330
157      330 IF (ITER-27) 360,360,340
158      340 WRITE(6,350) IIS, TX1, TX2, TY1, TY2, TE1, TE2
159      350 FORMAT(44H01 ITERATION FOR DISCHARGE TEMPERATURE OF SLOT ,I2,11HMA5
AFAILED,/1H0,10X,6HTX1 = E20.7,10X,6HTX2 = E20.7/1H0,10X,6HTY1 = E2
X0.7,10X,6HTY2 = E20.7/1H0,10X,6HTX1 = E20.7,10X,6HTX2 = E20.7)
160      IE=2
161      RETURN
162      360 IF (KDUMP(3)) 390,390,370
163      370 WRITE(6,380) ITER,TS,T,TX2,TY2,TE1,TE2
164      380 FORMAT(2X,5HITER=I2,2X,3HTS=IPE11.4,2X,2HT=IPE11.4,2X,4HTX2=IPE11.
X4,2X,4HTY2=IPE11.4,2X,3HE1=IPE11.4,2X,3HE2=IPE11.4//)
165      390 IF (ABS(TE1)-.001) 410,410,400
166      400 TS=(TE2*TX1-TE1*TX2)/(TE2-TE1)
167      GO TO 40
168      410 CONTINUE
169      WSLTD(IIS)=WDOTSD
170      UA(IIS)=WDOTSD*R*TS/(PSA(IIS)*PI*HF**2.)
171      APA(IIS)=PI*RF**2.
172      ABSLTA(IIS)=AFF
173      IF (SLTBARN(IIS).EQ.2..OR.SLTARN(IIS).EQ.3.) ABSLTA(IIS)=0.0
174      DWDTS(IIS)=DWDI
175      POA(IIS)=PSA(IIS)*(TO/T)**(GAMA/(GAMA-1.))
176      TSA(IIS) = TS
177      U      = UTMP
178      T      = TS
179      AMACH=U/SQRT(GNOT*GAMA*R*T)
180      AMPN=AMAX1(AMPN,AMACH)
181      DELTA=WDOTD*ZERODV(12.*AP*U)
182      PO=PD(IS2)*(TO/T)**(GAMA/(GAMA-1.))
183      P=PD(IS2)
184      WDOT=WDOTD
185      I1I=IS2
186      I1J=IS2

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```

187      IF(KOUMP(3))440,440,420          99640
188      CONTINUE                          99650
189      WRITE(6,430)WSLOT(IIS),APF(IIS),UP(IIS),POF(IIS),PSF(IIS),TSF(IIS
      X),PD(IS1),WSLOT0(IIS),APA(IIS),UA(IIS),POA(IIS),PSA(IIS),TSA(IIS),
      XPD(IS2),DWSLTF(IIS),RBSLTF(IIS),ABSLTF(IIS),DWSLTA(IIS),
      XHBSLTA(IIS),ABSLTA(IIS),DWDTS(IIS)          99660
190      430      FORMAT(1H0,7HWSLOTI=1PE11.4,2X,4HAPF=1PE11.4,2X,3HUF=1PE11.4,2X,4H
      XPOF=1PE11.4,2X,4HPSF=1PE11.4,2X,4HTSF=1PE11.4,2X,8HPOD(IS1)=1PE11.4
      X/1X,7HWSLOT0=1PE11.4,2X,4HAPA=1PE11.4,2X,3HUA=1PE11.4,2X,4HPOA=1PE
      X      11.4,2X,4HPSA=1PE11.4,2X,4HTSA=1PE11.4,2X,8HPOD(IS2)=1PE11.4/
      X1X,7HDWSLTF=1PE11.4,2X,7HRSBLSLTF=1PE11.4,2X,7HABSLTF=1PE11.4/1X,7HD
      XWSLTA=1PE11.4,2X,7HRSBLSLTA=1PE11.4,2X,7HABSLTA=1PE11.4,2X,6HDWDTS=1
      XPE11.4)          99670
191      440      IF(UOPS.GT. 0.5)GO TO 500          99700
192      ISP1=IIS+1                          99710
193      IF(SCUR(IIS,2)-SCUR(ISP1,1)+TSLOTA(IIS)-TSLOTF(ISP1))500,450,450    99720
194      450      UOPS=1.0                    99730
195      WDOTSI=WDOTSI+(SCUR(ISP1,1)-SCUR(IIS,2))*AFF*DELF/DELT          99740
196      ITEX=2                              99750
197      ICOUNT=0                            99760
198      DP=PD(IS1)-PD(IS2)                  99770
199      460      IF(ZCALC(IS2)-SCUR(ISP1,2))470,490,490          99780
200      470      IS2=IS2+1                  99800
201      IF(IS2=NI)460,480,480              99810
202      480      IS2=NI                    99820
203      490      IS2=IS2-1                  99830
204      GO TO 80                            99840
205      500      ABSLOT=ABSL0T+ABSLTF(IIS)+ABSLTA(IIS)          99850
206      IIS=IIS+1                          99860
207      SLTFLG=-1.0                        99870
208      RETURN                              99880
209      END                                99900

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SYMBOL	-----	REFERENCES	-----
5	" 24	25*	
6	" 25	26*	
10	" 24	33*	
20	" 33	34*	
25	" 32	40*	
30	" 25	33	49*
32	" 68	72*	
34	" 71	74*	
40	" 80*	167	
50	" 80	81*	
60	" 80	83*	156
70	" 80	82	84*
80	" 88*	145	204
90	" 88	89*	
100	" 88	91*	133
110	" 88	90	92*
120	" 99	100*	
130	" 104	105*	
140	" 104	107*	
150	" 99	112*	
160	" 115	116*	
170	" 115	119*	
180	" 118	121*	
190	" 111	123*	
200	" 123	124*	
210	" 123	126*	
220	" 125	127*	
230	" 133	134*	
240	" 134	135*	
250	" 135WR	136*	
260	" 134	140*	
270	" 140	141*	
280	" 141WR	142*	
290	" 140	143*	
300	" 143	144*	
310	" 143	146*	
320	" 149*		
330	" 156	157*	
340	" 157	158*	
350	" 158WR	159*	
360	" 157	162*	
370	" 162	163*	
380	" 163WR	164*	
390	" 162	165*	
400	" 165	166*	
410	" 48	165	168*
420	" 187	188*	
430	" 189WR	190*	
440	" 187	191*	
450	" 193	194*	
460	" 199*	201	
470	" 199	200*	
480	" 201	202*	

I N D E X

SUBROUTINE SLOT(IE)

PAGE 442

490 - 199 203*
 500 - 191 191 205*
 * ABCYL - 800
 ABS - 61 143 165
 ABSLOT - 1900 205=
 ABSLTA - 1000 172= 173= 189WR 205
 ABSLTF - 1000 41= 65= 66= 189WR 205
 ACCEL - 800 123 126
 AFF - 1300 97 172 195
 AFHI - 1100 41 54 65
 AHO - 1200
 AINC - 700
 AINCHI - 800 126
 AINCH - 1500 126
 AJPP - 1300
 AKGY - 1500
 AKKST - 1500
 AL - 1300
 ALA - 700
 ALB - 700
 ALE - 700
 ALL - 1300
 ALPA - 1200
 ALPY - 1200
 ALS1 - 700
 ALS2 - 700
 * AMACH - 800 61= 67 68 179= 180
 * AMAX1 - 180
 * AMINI - 103 120
 AMPN - 1500 180=
 AMSQ - 67= 69 70
 AMW - 1500
 AMWG - 300
 AN160 - 800
 ANLUPS - 800
 ANO - 700
 AP - 1400 102 108 119 121 122 126 149 181
 APA - 1000 171= 189WR
 APF - 1000 40= 64= 189WR
 APHI - 800 108 121 126
 APX - 1200
 APY - 1200
 ASE - 1300
 ASI - 1300
 ASLVR - 1200
 AT - 1500
 AW - 700
 * BRNOUT - 1400
 * CONA - 8*
 * CONG - 9*
 * CONJ - 10*
 * CONK - 11*
 * CONU - 12*
 * CONT - 13*
 * CONSTS - 2*

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I N D E X

SUBROUTINE SLOT(1E)

PAGE 444

	UOPS	-	22=	191	194=														
	P	-	15C0	49=	94=	183=													
	PA	-	6C0	33	34	35	36	37	38	39									
*	PARMAA	-	20*																
*	PARMB	-	14*																
*	PARMF	-	15*																
*	PARMH	-	16*																
*	PARMS	-	17*																
*	PARMY	-	18*																
*	PAK4Z	-	19*																
	PBAK	-	59=	108	109=														
	PD	-	9C0	26=	27=	33	34=	35=	49	58	60	69	75=	86	89				
			91	147=	149	182	183	189WR	198										
	PDX1	-	21JA	92	93=	131	135WR	144											
	PDX2	-	92=	135WR	141WR	144													
	PDY	-	108=	109	110	121=	122=	127=	129	141WR	146								
	PDY1	-	21JA	128	129=	131	135WR												
	PDY2	-	128=	135WR	141WR														
	PH	-	15C0																
	PHI	-	6C0	26	27	28	29	30	31										
	PI	-	2C0	40	60	62	63	64	170	171									
	PI02	-	2C0																
	PMAX	-	14C0																
	PMIN	-	14C0																
	PO	-	19C0	57	182=														
	POA	-	10C0	31=	39=	175=	189WR												
	POF	-	10C0	30=	38=	57=	189WR												
	PON	-	15C0																
	PRESS	-	3C0																
	PRNI	-	6C0																
	PSA	-	10C0	24=	36=	89=	91=	93	94	102	112	119	121	127	126				
			141WR	144=	146=	147	170	175	189WR										
	PSAFK	-	18C0	112	122														
	PSF	-	10C0	29=	37=	58=	59	108	109	110	112	121	122	126	189WR				
	PSFPR	-	18C0	112	122														
	R	-	3C0	60	61	78	102	107	112	119	121	122	126	142	149				
			170	179															
	RA	-	13C0																
	RADIAN	-	2C0																
	RAU	-	13C0																
	RB	-	9C0																
	RBHI	-	12C0																
	RBSLOT	-	16C0	52=	53	54	96=	97	98										
	RBSLTA	-	11C0	98=	189WR														
	RBSLTF	-	11C0	53=	189WR														
*	RBSUB	-	50*	95*															
	RBZ	-	9C0																
	RBZTO	-	9C0																
	RC	-	13C0																
*	RETURN	-	139*	161*	208*														
	RF	-	7C0	62	63	170	171												
	RFHI	-	12C0	40	60	62	63	64											
	RSLOTA	-	16C0	62															
	RSLOTF	-	16C0	62															
	RZ	-	7C0																

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I N D E X

SUBROUTINE SLOT(IE)

PAGE 446

WDOT	-	1400	51	69	70	108	121	184=						
WDOTD	-	1400	45=	51=	55	100=	101	102	104	105=	108	114=	115	116=
		119	121	141WR	149	181	184							
WDOTI	-	800												
WDOTSD	-	42=	101=	113=	114	169	170							
WDOTSI	-	46=	55=	56	60	100	113	195=						
w1	-	1300												
WORKA	-	7*												
WSLOTD	-	1000	169=	189WR										
WSLOTI	-	1000	47=	56=	189WR									
WT	-	1300												
XBARIH	-	1300												
XBAR	-	107=	108											
XR	-	1300												
ZCALC	-	800	199											
ZERODV	-	THE VARIABLE- ZERODV -IS USED BEFORE IT IS DEFINED												
		69	70	102	119	131	144	181						

INDEX

FUNCTION SQRT (X)

PAGE 447

1	FUNCTION SQRT (X)	
2	SQRT = 0.0	670
3	IF (X .NE. 0.0) SQRT = (ABS(X)) **.5	680
4	RETURN	690
5	END	700

SYMBOL		REFERENCES			
* ABS	-	3			
* RETURN	-	4*			
* SQR	-	1*	2=	3=	
X	-	1AG	3		

```

1  SUBROUTINE SUBSON(ICHUKE,IOPT)
2  IMPLICIT REAL (A-H,O-Z,M)
3  COMMON/CONSTS/GNOT,PI,PI02,RADIAN
4  COMMON/INPUT6/CSTAR,GAMA,R,NCSTR,PRESS(20);CSTR(20),GAMAG(20),
5  1  AMWG(20),TCOMB(20),NCSCOE
6  COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KOUMP(72)
7  COMMON/COMA/DELT,APHI,WDOTI,ANIBO,TIMEW,UI,ANLOPS,ACCEL,
8  1  ABCYL,PHNT(101,15),AINCHI,AMACH,ZCALC(101)
9  COMMON/COMW/DV,AEE,PEP01
10 COMMON/PARMB/AP,PMIN,PMAX,WDOT,III,IIJ,WDOTD,NSLOT,NTABE,NTIME,
11 1  TAUTO,TOFLAG,NINCPL,BRNOUT,IIS,IS1,IS2,VI,SCUR(18,2)
12 COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,A1,
13 1  AMW,AKRST
14 COMMON/PARMAA/TO,IFLAG
15 COMMON/PARMAK/PIAT,AENT,U1A,PIA,P1B,A2A,VGA,PMA,PMZ,TMA,VGAZ,
16 5  MUBETA,U1B,A1A,MD1B
17 COMMON/PARMAA/ A1B,A2B
18 NAMELIST/SUBS1/PRCRIT,MEX,AEXAS,AENTAS
19 NAMELIST/SUBS2/ITER, MBETA,THETA,CBETA,UBETA,UMA,PBETA,PONC,
20 4  PON
21 ICHUKE=0
22 ITER=0
23 STO=IOPT-2
24 IF (PA.GT.0.0) GO TO 10
25 5 ICHUKE=1
26 RETURN
27 10 PON=PIAT
28 PRCRIT=(2./(GAMA+1.))*((GAMA/(GAMA-1.))
29 C WRITE(6,SUBS1)
30 15 IF (PA/PON.LE.PRCRIT) GO TO 5
31 MEX=SQRT((2./(GAMA-1.))*((PON/PA))*((GAMA-1.)/GAMA)-1.))
32 C WRITE(6,SUBS1)
33 IF (MEX.GE.1.0) GO TO 5
34 AEXAS=(1./MEX)*(((2./(GAMA+1.))*((1.+(GAMA-1.)/2.*MEX**2))**
35 5 ((GAMA+1.)/(2.*(GAMA-1.))))
36 AENTAS=(AENT/AEE)*AEXAS
37 C WRITE(6,SUBS1)
38 IF (AENTAS.LT.1.0) GO TO 5
39 CALL MACH(AENTAS,GAMA,MBETA)
40 TBETA = TO/(1.+(GAMA-1.)/2.*MBETA**2)
41 CBETA = SQRT(GAMA*GNOT*R*TBETA)
42 UBETA = MBETA*CBETA
43 UMA = UBETA + U1A
44 PBETA = (1./AENT)*((PIA*A1A-P1B*A1B+(P1B*PIA)*(APA-A1A)/2.0
45 5 - VGA*UMA*(PMA-PMZ)/(12.*GNOT*R*TMA*DELT)*STO
46 5 - PMA*UMA*(VGA-VGAZ)/(12.*GNOT*R*TMA*DELT)*STO
47 5 - UBETA*MDHETA/GNOT + U1A*WDOT/GNOT + U1B*MD1B/GNOT)
48 35 PONC = PBETA*(1.+(GAMA-1.)/2.*MBETA**2))*((GAMA/(GAMA-1.))
49 C WRITE(6,SUBS2)
50 IF (ABS(PON-PONC).LE.0.001) RETURN
51 PONZ=PON
52 PON = PON/PONC *PON
53 ITER=ITER+1
54 IF (ITER.LT.25) GO TO 15
55 WRITE(6,1000) PON,PONC,PONZ

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42      1000 FORMAT('0ITERATIONS EXCEEDED IN SUBSON',/, 'P0N=',F10.4,3X,'P0NC=',  
43             $ F10.4,3X,'P0NZ=',F10.4)  
44      RETURN  
      END
```

I N D E X

SUBROUTINE SUBSON(ICHUKE,IOP1)

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SYMBOL	REFERENCES
5	19*
10	18
15	23*
1000	41WR
ABCYL	6CO
* ABS	36
ACCEL	6CO
AEE	7CO
AENT	11CO
AENTAS	13NM
AEXAS	13NM
AINCHI	6CO
AINCW	9CO
AKGY	9CO
AKHSI	9CO
AMACH	6CO
AMPN	9CO
AMW	9CO
AMWG	4CO
ANIBO	6CO
ANLOPS	6CO
AP	8CO
APHI	6CO
AT	9CO
A1A	11CO
A1B	12CO
A2A	11CO
A2B	12CO
BRNOUT	8CO
CBETA	14NM
* COMA	5*
* COMW	7*
* CONSTS	3*
CSTAR	4CO
CSTR	4CO
DELF	5CO
DELT	6CO
DELTA	9CO
DELZ	5CO
DIS	9CO
DV	7CO
GAMA	4CO
GAMAG	4CO
GNOT	3CO
HCO	5CO
ICHUKE	1AG
IFLAG	10CO
III	8CO
IIJ	8CO
IIS	8CO
* INPUTG	4*
* INPUTU	5*
IOP1	1AG

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I N D E X

SUBROUTINE SUBSON(1CHOKE,1OPT)

PAGE 453

TIME	-	9C0			
TIMEW	-	6C0			
TMA	-	11C0	34		
TO	-	10C0	30		
TOFLAG	-	8C0			
U	-	9C0			
UBETA	-	14NM	32=	33	34
UMA	-	14NM	33=	34	
UT	-	6C0			
UIA	-	11C0	33	34	
UIB	-	11C0	34		
VGA	-	11C0	34		
VGAZ	-	11C0	34		
WDOT	-	8C0	34		
WDOTD	-	8C0			
WDOTI	-	6C0			
ZCALC	-	6C0			

	SUBROUTINE S2SK(K)	80750
C	CCCCCCCCCC	80950
C	SUBROUTINE S2SK DETERMINES THE SECTOR SURFACE AREA ON THE	80970
C	PSEUDOELLIPSOID OF THE PROJECTED GRAIN CROSS-SECTION FOR THE BLOCK	80980
C	2B ANALYSIS IN SUBROUTINE SCTOR2 OF THE HEAD END WITH WEB (SECTION	80990
C	5.2.1.3).	81000
C	CCCCCCCCCC	81020
2	COMMON/INPUTA/BTAE,DH1,BH,AOHM,RIG,HMH	
3	COMMON/INPUTC/AK,AKK,DLRF,DRVRF	
4	COMMON/INPUTO/KPLANE,KMOICG	
5	COMMON/WORK45/A(5),R1,R9,TI1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03,	
6	R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,	
7	ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2.	
8	T+3,TH4,B7IM,B72M,B91M,B92M	
9	COMMON/WORKA/AINC,A4NO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8.	
10	ALS1,ALS2,ALA,ALB,ALE,AW(5)	
11	COMMON/COMB/ANH,AJPHN,AJBHN,TAUAQ,AJPHEI,AJRHEQ,AJPNDZ,AJRNQZ.	
12	XBH,XBN,DFINT	
13	COMMON/CDC/AMTJ,AMTI,AJPHQ,AJRHQ,XBIH,ALQ	
14	COMMON/COMR/DELLR,RPZ,XPZ,AZ	
15	COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(IJ),XBARIH,ASF,AFF,WI,WT,RA.	
16	RAO,ALL,AJPP,ASI	
17	COMMON/COMV/VSTR,VSTO,TDMAX,DOLIA,DOLIB,XMAX,ZMAX,YMAX,ALHO,	
18	ROPE1,ROPE2,ROPE3,ALDP	
19	COMMON/PARMH/BIE,BOE,AAVN,BX,RXX,ASII,DELLRI,HOPE4,ALE,YPI,ZP1,	
20	ARCO,ARC1,ROE1,ALITTL,ZI,AIG,THRI,THRO,AQE	
21	COMMON/PARML/HOLDL,AL3A,BRAK,ALI1A,AS,HPX,ZPO,YPO,DS,KBRAK,KVSTR	
22	COMMON/PARMO/ALP,KRASBB,CXRSSB,KGAM	
23	COMMON/PARMP/THRZ,RP1,RP2,RP3,RP4,RP5,RP6,RP10,RP11,RP12,RP13,XP1,	
24	XP3,XP5,XP11,XP13	
C		
16	GO TO (10,200,210,220,230,240,250,20,300,290,280,270,260) I,K	81030
17	ZPO=RI	81040
18	RPX=RP1	81050
19	THRU=0.	81060
20	KXRSBB=1	81070
21	HOLDL=ZPO	81080
22	DELLR=DELLRI	81090
23	CALL YPSUB(ZPO,BTAE,BOE,YPO,ARCD,3)	81100
24	IF(RPX-ZPO-DELLR)>40,30,30	81110
25	ZP1=ZPO-DELLR	81120
26	GO TO 50	81130
27	ZP1=RPX	81140
28	50 IF(ZP1-RF/10000.-ZPO)/310,310,60	81150
29	CALL YPSUB(ZP1,BTAE,BOE,YPI,ARC1,3)	81160
30	US=SQR((ZP1-ZPO)**2+(YPI-YPO)**2)	81170
31	ZP1=HOLDL	81180
32	IF(DS)70,80,70	81190
33	DELLR=DELLR*AKK/DS	81200
34	IF(RPX-ZP1-DELLR)<100,90,90	81210
35	ZP1=ZP1+DELLR	81220
36	GO TO 110	81230
37	ZP1=RPX	81240
38	110 CALL YPSUB(ZP1,BTAE,BOE,YPI,ARC1,3)	81250
39	BX=XNZ-TAN(AZ)*SQRT(RPZ**2-XNZ**2)	81260
		81270

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40      TEMP=(TAN(AZ)**2+1.)*(BX**2-ZP1**2)*4.      81280
41      TEMP1=2.*BX*TAN(AZ)      81290
42      TEMP1=SQRT(TEMP1**2-TEMP)-TEMP1      81300
43      TEMP=TEMP1/(2.*(1.+TAN(AZ)**2))      81310
44      ALP=(TEMP-SQRT(RPZ**2-XPZ**2))/COS(AZ)      81320
45      CALL XRTHR(1)      81330
46      CALL XRTHR(2)      81340
47      CALL YPSUB(ZP0,BTAE,B0E,YP0,ARCO,1)      81350
48      CALL YPSUB(ZP1,BTAE,B0E,YP1,ARC1,2)      81360
49      CALL ROE1SB      81370
50      CALL LBSUB      81380
51      CALL ZISUB      81390
52      IF(ZP1+TAU*SIN(ARC1)-Z1)130,120,120      81400
53      120      AS=ASI      81410
54      GO TO 170      81420
55      130      ALQ=(ROE1+TAU)*(ARC1-ARCO)      81430
56      IF(KMOICG)150,140,150
57      140      CALL MTISUB      81450
58      AJPHN=AJPHN-AMTJ      81460
59      AJBMN=AJBMN-AMTJ      81470
60      150      AS=ASI-ALQ*(THPI+THRO)*((ZP1+ZP0)/2.+TAU*SIN((ARCO+ARC1)/2.))/2.      81480
61      ASI=AS      81490
62      IF(TAU)170,160,170      81500
63      160      DWB=(Z1-ZP1)/SIN(ARC1)      81510
64      DS1=ROE1*(ARC1-ARCO)      81520
65      DS2=(ROE1+DWB)*(ARC1-ARCO)      81530
66      XWB=(DS2+DS1+DS2)*DWB/(3.*(DS2+DS1))      81540
67      ZG=(ZP0+ZP1)/2.+XWB*SIN((ARC1+ARCO)/2.)      81550
68      VST0=VST0+((ROE1+DWB)**2-ROE1**2)*(THRI+THRO)*ANO*ZG/2.      81560
        X*(ARC1-ARCO)      81570
69      170      IF(RF/10000.+ZP1-RPX)180,310,310      81580
70      180      ZP0=ZP1      81590
71      YP0=YP1      81600
72      THRO=THRI      81610
73      HOLDR=ZP1      81620
74      ZP1=ZP1+DELLR      81630
75      IF(ZP1-RPX)60,60,190      81640
76      190      ZP1=RPX      81650
77      GO TO 60      81660
78      200      ZP0=RP1      81670
79      RPZ=RP1      81680
80      XPZ=XP1      81690
81      AZ=A(1)      81700
82      RPX=RP2      81710
83      THRZ=THRI      81720
84      THRO=THRI      81730
85      KKRSB8=2      81740
86      GO TO 20      81750
87      210      ZP0=RP2      81760
88      RPX=RP3      81770
89      THRO=THRI      81780
90      KKRSB8=5      81790
91      GO TO 20      81800
92      220      ZP0=RP3      81810
93      RPZ=RP3      81820

```


94		XPZ=XPJ	81830
95		AZ=A(2)	81840
96		RPX=RP4	81850
97		THRZ=THRI	81860
98		THRO=THRI	81870
99		KXRSBB=6	81880
100		GO TO 20	81890
101	230	ZPO=RP4	81900
102		RPX=RP5	81910
103		THRO=THRI	81920
104		KXRSBB=7	81930
105		GO TO 20	81940
106	240	ZPO=RP5	81950
107		RPZ=RP5	81960
108		XPZ=XP5	81970
109		RPX=RP6	81980
110		AZ=A(3)	81990
111		THRO=THRI	82000
112		THRZ=THRI	82010
113		KXRSBB=8	82020
114		GO TO 20	82030
115	250	ZPO=RP6	82040
116		RPX=RP-TAUW	82050
117		THRO=THRI	82060
118		KXRSBB=9	82070
119		GO TO 20	82080
120	260	ZPO=RP9	82090
121		RPX=RP13	82100
122		THRO=0.	82110
123		KXRSBB=16	82120
124		GO TO 20	82130
125	270	ZPO=RP13	82140
126		RPZ=RP13	82150
127		XPZ=XP13	82160
128		AZ=A(5)	82170
129		RPX=RP12	82180
130		THRZ=THRI	82190
131		THRO=THRI	82200
132		KXRSBB=15	82210
133		GO TO 20	82220
134	280	ZPO=RP12	82230
135		RPX=RP11	82240
136		THRO=THRI	82250
137		KXRSBB=14	82260
138		GO TO 20	82270
139	290	ZPO=RP11	82280
140		RPZ=RP11	82290
141		XPZ=XP11	82300
142		AZ=A(4)	82310
143		RPX=RP10	82320
144		THRZ=THRI	82330
145		THRO=THRI	82340
146		KXRSBB=11	82350
147		GO TO 20	82360
148	300	ZPO=RP10	82370

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SUBROUTINE S2SK(K)

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```

149      RPX=RF-TAUW
150      THRO=THRI
151      KXRSBB=10
152      GO TO 20
153      RETURN
154      END

```

```

82380
82390
82400
82410
82420

```

SYMBOL		REFERENCES													
10	-	16	17*												
20	-	16	21*	86	91	100	105	114	119	124	131	138	147	152	
30	-	24	25*												
40	-	24	27*												
50	-	26	28*												
60	-	28	29*	75	77										
70	-	32	33*												
80	-	32	34*												
90	-	34	35*												
100	-	34	37*												
110	-	36	38*												
120	-	52	53*												
130	-	52	55*												
140	-	56	57*												
150	-	56	60*												
160	-	62	63*												
170	-	54	62	69*											
180	-	69	70*												
190	-	75	76*												
200	-	16	78*												
210	-	16	87*												
220	-	16	92*												
230	-	16	101*												
240	-	16	106*												
250	-	16	115*												
260	-	16	120*												
270	-	16	125*												
280	-	16	134*												
290	-	16	139*												
300	-	16	148*												
310	-	28	69	153*											
A	-	500	81	95	110	128	142								
AANN	-	1200													
AFF	-	1000													
AHH	-	700													
ALS	-	1200													
ALNC	-	600													
AJBHED	-	700													
AJBHN	-	700	59=												
AJBHO	-	800													
AJBNOZ	-	700													
AJPHED	-	700													
AJPHN	-	700	58=												
AJPHO	-	800													
AJPNOZ	-	700													
AJPP	-	1000													
AK	-	300													
AKK	-	300	33												
AL	-	1000													
ALA	-	600													
ALB	-	600													
ALC	-	500													
ALD	-	500													

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I N D E X

SUBROUTINE S2SK(K)

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R7	-	6C0																	
R8	-	6C0																	
R9	-	5C0	120																
* SIN	-	52	60	63	67														
* SQRT	-	30	39	42	44														
SUMDV	-	10C0																	
* S2SK	-	1*																	
* TAN	-	39	40	41	43														
TAU	-	10C0	52	55	60	62													
TAUAG	-	7C0																	
TAUM	-	5C0																	
TAUW	-	6C0	116	149															
IDMAX	-	11C0																	
TEMP	-	40=	42	43=	44														
TEMP1	-	41=	42=	43															
THR1	-	12C0	60	68	72	83	84	89	97	98	103	111	112	117					
THRD	-	130	131	136	144	145	150												
	-	12C0	19=	60	68	72=	84=	89=	98=	103=	111=	117=	122=	131=					
	-	136=	145=	150=															
THR2	-	15C0	83=	97=	112=	130=	144=												
TH1	-	5C0																	
TH2	-	5C0																	
TH3	-	5C0																	
TH4	-	5C0																	
T10M	-	5C0																	
T12M	-	5C0																	
T2M	-	5C0																	
T4M	-	5C0																	
T5M	-	5C0																	
T6M	-	5C0																	
T7M	-	5C0																	
T9M	-	5C0																	
VST0	-	11C0	68=																
VSTR	-	11C0																	
WI	-	10C0																	
* WORKA	-	6*																	
* WORK+5	-	5*																	
WT	-	10C0																	
XBARIH	-	10C0																	
XBH	-	7C0																	
XBIH	-	8C0																	
XBN	-	7C0																	
XMAX	-	11C0																	
XP2	-	9C0	39	44	80=	94=	108=	127=	141=										
XP1	-	15C0	80																
XP11	-	15C0	141																
XP13	-	15C0	127																
XP3	-	15C0	94																
XP5	-	15C0	108																
XR	-	10C0																	
* XRTHR	-	45*	46*																
XWB	-	66=	67																
X011	-	5C0																	
X03	-	5C0																	
X05	-	5C0																	

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[illegible]

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1	SUBROUTINE TDGRE (A,B,C,X)	58020
	CC	58040
	C SUBROUTINE TDGRE DETERMINES THE LARGEST REAL ROOT OF A THIRD	58060
	C DEGREE POLYNOMIAL FOR THE ARGUMENT X.	58070
	CC	58080
2	TEMP1=4.*A*C	58110
3	TEMP1=SQRT (8**2-TEMP1)	58120
4	TEMP2=(TEMP1-3)/(2.*A)	58130
5	TEMP3=(-8-TEMP1)/(2.*A)	58140
6	IF (TEMP3-TEMP2) 20,10,10	58150
7	10 X=TEMP3	58160
8	GO TO 30	58170
9	20 X=TEMP2	58180
10	30 RETURN	58190
11	END	

SYMBOL	-----	REFERENCES	-----
10	-	6	7*
20	-	6	9*
30	-	8	10*
A	-	1AG	2
B	-	1AG	1
C	-	1AG	2
* RETURN	-	10*	
* SQR	-	3	
* TDGRE	-	1*	
TEMP1	-	2=	3=
TEMP2	-	4=	6
TEMP3	-	5=	7
X	-	1AG	7=

INDEX

SUBROUTINE THETAR(RAT,XRAT,THR)

PAGE 465

1	SUBROUTINE THETAR(RAT,XRAT,THR)	82440
	CC	82460
C	SUBROUTINE THETAR DETERMINES THE ANGLE BETWEEN THE Z-AXIS AND THE	82480
C	LINE SEGMENT RAT FOR THE BLOCK 1 ANALYSIS IN SUBROUTINE SCI OF THE	82490
C	HEAD END WITH WEB (SECTION 5.2.1.1.).	82500
	CC	82520
2	IF (RAT) 20,10,20	82540
3	10 THR=0.	82550
4	GO TO 30	82560
5	20 THR=ACOS(SQRT(RAT**2-XRAT**2)/RAT)	82570
6	30 RETURN	82580
7	END	

SYMBOL	-----	REFERENCES	-----
10	-	2	3*
20	-	2	5*
30	-	4	6*
	THE VARIABLE-	ACOS	-IS USED BEFORE IT IS DEFINED
ACOS	-	5	
RAT	-	1AG	2
RETURN	-	6*	
SORT	-	5	
THETAR	-	1*	
THR	-	1AG	3=
XRAT	-	1AG	5=

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1      SUBROUTINE TISUB(IE)                                99960
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 100180
C      SUBROUTINE TISUB DETERMINES THE VALUE OF DELT FOR THE STEADY STATE 100200
C      INTERNAL BALLISTIC SOLUTION NEGLECTING TRANSIENT EFFECTS AND      100210
C      MODIFIES THE VALUES OF THICKNESS BURNED IN EACH INCREMENT DIVIDING 100220
C      PLANE AFTER THE BALLISTIC SOLUTION IS CONVERGED FOR EACH TIME      100230
C      POINT.                                                    100240
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 100260
2      COMMON/BLK005/ NLEWIS,NSI,NF,NRECON,NCASES,NDISP,NCASE      ALL
3      COMMON/INPUTM/STFLAG,STDYST,DELTST,DELTSS,DELTTO
4      COMMON/INPUTN/AITST,PST,TST,TIMPT1,TIMPT2,DELTSP,ANITW
5      COMMON/INPUTT/SB(18),SLTRN(18),SA(18)
6      COMMON/INPUTU/DELF,PA,PHI,HCO,DELZ,KDUMP(72)
7      COMMON/INPUTW/ TAUMNA,TAUMNB
8      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1     ALS1,ALS2,ALA,ALB,ALE,AW(5)
9      COMMON/DUMYR/JUMP,NBACK
10     COMMON/COMA/DELT,APHI,WDOTI,ANIBO,TIMEW,UT,ANLOPS,ACCEL,
1     ABCYL,PRNT(101,15),AINCHI,AMACH,ZCALC(101)
11     COMMON/COMG/TAUZ(101),RBZ(101),TAUZTO(101),RBZTO(101),PD(101),
1     TAUWDP(101),RB,VF,DWDOT,VP
12     COMMON/COMJ/ABSLTA(18),ABSLTF(18),APA(18),APF(18),PSA(18),
1     PSF(18),POA(18),POF(18),TSA(18),TSF(18),UA(18),
2     UF(18),WSLOTD(18),WSLOTI(18)
13     COMMON/COMK/DWSLTA(18),DWSLTF(18),DWDTS(18),AFHI,RBSLTA(18),
1     RBSLTF(18),TSLOTA(18),TSLOTF(18)
14     COMMON/COMM/TAUTOZ,RSLVRV,AX(45),AY(45),AINCX,ANOX,RFX,TAUWX,
1     UOMX(17),AJNCY,ANOY,RFY,TAUWY,DUMY(17),VFPP
15     COMMON/COMM/TS�VRX,TS�VRY
16     COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARIH,ASE,AFF,WI,WT,RA,
1     RAO,ALL,AJPP,ASI
17     COMMON/PARMB/AP,PMIN,PMAX,WDOT,I1I,I1J,WDOTD,NSLOT,NTAHE,NTME,
1     TAUTO,TGFLAG,NINCPL,BRNOUT,I1S,I1I,I1J,NT,SCUR(18,2)
18     COMMON/PARMF/PH,TIME,AINCW,T,P,DELTA,U,AKGY,PON,DIS,AMPN,AT,
1     AMW,AKRST
19     COMMON/PARMG/VFH,AAN,VFN,VIS,AIT,SPHOT,SPONDT,VFINT,VEH,ABTOT
20     COMMON/PARMS/ICHN
21     COMMON/PARMY/PSAPR(18),PSFPR(18)
22     COMMON/PARMAB/ HSUBMG,NSUBMG,NEND,ASEA,ASEB,SUMDVA,SUMDV
23     EQUIVALENCE (AX(38),TAUMX),(AY(38),TAUMY)
24     IF(I1I)1010,1010,20
25     20 IE=0                                                    100300
26     30 I1I=I1I+1                                              100310
27     I1J=I1J+1                                              100320
28     TAU=TAUZ(I1I)                                          100330
29     RB=RBZ(I1J)                                           100340
30     AINC=ZCALC(I1I)                                       100350
31     TEMP=(AINC-AINCX)/(AINCY-AINCX)                      100360
32     TAUW=TAUWX+TEMP*(TAUWY-TAUWX)                       100370
33     TAUM=TAUMX+TEMP*(TAUMY-TAUMX)                       100380
34     TAUWDP(I1I)=TAUW
35     TS�VRW=TS�VRX+TEMP*(TS�VRY-TS�VRX)                  100390
36     RSLVR=AMIN1(TS�VRW,TAUM)                             100400
37     IF(TS�VRW.EQ.0.0) RSLVR=TAUM
38     TEMP1=RB*DELT*TAU                                       100480

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39      TEMP1=AMIN1(TEMP1,RSLVR)          100490
40      TEMP2=RBZTO(IIJ)*DELT+TAUZTO(III)
41      TEMP2=AMIN1(TEMP2,RSLVR)
42      TEMP3=RBZLTF(IIS)*DELT
43      TEMP4=SCUR(IIS,1)=TEMP3
44      IF(TJUMP.EQ.1) GO TO 200
45      IF(AINC.GT.(TEMP4-.0001)) GO TO 120
46      IF(TEMP1.LT.TAUM) GO TO 70
47      IF(TAU.LT.TAUM) GO TO 80
48      70  TAUZ(III)=TEMP1
49          TAUZTO(III)=TEMP2
50          PRNT(III,13)=TAUZ(III)          100610
51          PRNT(III,15)=TAUZTO(III)        100620
52          GO TO 90
53      80  WRITE(6,85) AINC
54      85  FORMAT('POWER BURNOUT INCREMENT LOCATION/'',1PF14.7)
55          ANIB0=ANIB0+1.0
56          GO TO 70
57      90  DEL=ABS(AINC-AINCY)
58          IF(DEL.GT.(.0001)) GO TO 30
59          DEL=ABS(AINC-HC0)
60          IF(DEL.GT.(.0001)) RETJRN
61      100 IF(NSUBMG.GT.0) GO TO 105
62          RSLVRN=AMIN1(TSLVR,TAUMY)
63          IF(TSLVR.EQ.0.0) RSLVRN=TAUMY
64          TAUZ(III+1)=TAUZ(III+1)+RBZ(IIJ+1)*DELT
65          TAUZTO(III+1)=TAUZTO(III+1)+RBZTO(IIJ+1)*DELT
66          TAUZ(III+1)=AMIN1(TAUZ(III+1),RSLVRN)
67          TAUZTO(III+1)=AMIN1(TAUZTO(III+1),RSLVRN)
68          PRNT(III+1,13)=TAUZ(III+1)
69          PRNT(III+1,15)=TAUZTO(III+1)
70          GO TO 110
71      105 TAUZ(III+1)=TAUZ(III+1)+RBZ(III+1)*DELT
72          TAUZ(III+1)=AMIN1(TAUZ(III+1),TAUMNA)
73          TAUZTO(III+1)=TAUZ(III+1)
74          TAUZ(III+2)=TAUZ(III+2)+RBZ(III+2)*DELT
75          TAUZ(III+2)=AMIN1(TAUZ(III+2),TAUMNB)
76          TAUZTO(III+2)=TAUZ(III+2)
77          PRNT(III+1,13)=TAUZ(III+1)
78          PRNT(III+1,15)=TAUZTO(III+1)
79          PRNT(III+2,13)=TAUZ(III+2)
80          PRNT(III+2,15)=TAUZTO(III+2)
81      110 IE=-1
82          RETURN
83      1010 IIS=1
84          DO 1020 I=1,NSLOT
85              PSFPR(I)=PSF(I)
86      1020 PSAPR(I)=PSA(I)
87              IF(ANIBD.LT.ANITW) GO TO 1030
88              BRNOUT=1.0
89      1030 IF(STFLAG.GT.0.0) GO TO 1040
90              IF(STDYST.GT.0.0) GO TO 1083
91      1033 WRITE(6,1035)
92      1035 FORMAT('OINVALID INPUT OF TIME CONTROL PARAMETERS/'', ERROR IN LINK
          $ 2 OF IBM MODULE')

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ORIGINAL PAGE IS
OF POOR QUALITY

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93      STOP
94      1040 IF(STOYST.GT.0.0) GO TO 1083
C      IF IN START-TRANSIENT, CHECK FOR LIMITING TIME, PRESSURE
C      OR TOTAL IMPULSE WHICH WILL TERMINATE START-TRANSIENT.
95      IF(TST)1050,1050,1045
96      1045 TEST=TST
97      HALT=TIME
98      GO TO 1070
99      1050 IF(PST)1060,1060,1055
100     1055 TEST=PST
101     HALT=PON
102     GO TO 1070
103     1060 IF(AITST)1080,1080,1065
104     1065 TEST=AITST
105     HALT=AIT
106     1070 IF(HALT.LT.TEST) GO TO 1110
107     STOYST=1.0
108     1083 IF(BRNOUT)1090,1090,1085
109     1085 IF(DELTTO.EQ.0.0) GO TO 1033
110     DELT=DELTTO
111     GO TO 1100
112     1090 IF(DELTSS.EQ.0.0) GO TO 1033
113     DELT=DELTSS
114     1100 CONTINUE
115     IF(TIMPT2.EQ.0.0) GO TO 20
116     IF((TIME.LT.TIMPT1).OR.(TIME.GE.TIMPT2)) GO TO 20
117     DELT=DELTSP
118     GO TO 20
119     1110 IF(DELTST.EQ.0.0) GO TO 1033
120     IF(INRECON.GT.0).AND.(TIME.GE.TST)) GO TO 1120
121     1115 IF(INRECON.GT.0).AND.(BRVOUT.GT.0.0)) GO TO 1130
122     1118 DELT = DELTST
123     GO TO 1100
124     1120 DELTST=DELTSS
125     GO TO 1115
126     1130 DELTST=DELTTO
127     GO TO 1118
128     120 IF(TAU.LT.RSLVR) GO TO 130
129     GO TO 175
130     130 IF((III-1).LE.0) GO TO 150
131     IF(AINC.GT.SCUR(IIS,1)) GO TO 150
132     IF(SLTBRN(IIS).EQ.1. .OR. SLTBRN(IIS).EQ.3.) GO TO 150
133     IF(TIME.LE.DELT) GO TO 150
134     WRITE(6,140) III,ZCALC(III)
135     140 FORMAT('0LATERAL BURNOUT INCREMENT LOCATION',10X,'ZCALC(',I3,
136     $ ' )=',E20,7)
136     150 IF(TEMP4.GT.0.0) GO TO 170
137     WRITE(6,160) IIS
138     160 FORMAT('0SLOT NUMBER',I3,' HAS BURNED INTO THE FORWARD DOME; PROGR
139     $AM EXECUTION HAS BEEN TERMINATED.')
139     IE=2
140     ICHN=5
141     RETURN
142     170 SCUR(IIS,1)=TEMP4
143     TSLOT(IIS)=TEMP3

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```

144      TAUZ(III)=TEMP1
145      TAUZTO(III)=TEMP2
146      PRNT(III,13)=TAUZ(III)
147      PRNT(III,15)=TAUZTO(III)
148      175 TEMP5=RSLTA(IIS)*DELT
149      TEMP6=SCUR(IIS,2)*TEMP5
150      180 IF(AINC.LT.(SCUR(IIS,2)-.0001)) GO TO 190
151      GO TO 195
152      190 III=III+1
153      IIJ=IIJ+1
154      AINC=ZCALC(III)
155      IF(III.LT.NI) GO TO 180
156      GO TO 240
157      195 IF(TEMP5.EQ.0.0) GO TO 196
158      GO TO 197
159      196 NBACK=0
160      GO TO 200
161      197 DEL=ABS(AINC-TEMP6)
162      IF(DEL.GT.0.0001) GO TO 199
163      198 NBACK=0
164      GO TO 200
165      199 IF(AINC.LT.(TEMP5-.0001)) GO TO 198
166      NBACK=1
167      200 IF(AINC.GT.(AINCY-.0001)) GO TO 260
168      JUMP=0
169      IF(TAU.LT.RSLVR) GO TO 210
170      IIS=IIS+1
171      GO TO 240
172      210 IF(AINC.GT.(TEMP5-.0001)) GO TO 230
173      IF(AINC.LT.SCUR(IIS,2)) GO TO 230
174      IF(SLTBRN(IIS).EQ.2. .OR. SLTBRN(IIS).EQ.3.) GO TO 230
175      IF(TIME.LE.DELT) GO TO 230
176      WRITE(6,220) III,ZCALC(III)
177      220 FORMAT('LATERAL BURNOUT INCREMENT LOCATION',10X,'ZCALC(',13,')=',
     & E20.7)
178      230 SCUR(IIS,2)=TEMP6
179      TSLOTA(IIS)=TEMP5
180      IIS=IIS+1
181      IF(AINC.GT.(AINCY-.0001)) GO TO 250
182      IF(NBACK.NE.1) GO TO 240
183      III=III-1
184      IIJ=IIJ-1
185      NBACK=0
186      AINC=ZCALC(III)
187      TEMP=(AINC-AINCX)/(AINCY-AINCX)
188      TAUM=TAUMX+TEMP*(TAUMY-TAUMX)
189      TSLVRW=TSLVRX+TEMP*(TSLVRY-TSLVRX)
190      RSLVR=AMIN1(TSLVRW,TAUM)
191      IF(TSLVRW.EQ.0.0) RSLVR=TAUM
192      240 TAUZ(III)=TAUZ(III)+RBZ(IIJ)*DELT
193      TAUZTO(III)=TAUZTO(III)+RBZTO(IIJ)*DELT
194      TAUZ(III)=AMIN1(TAUZ(III),RSLVR)
195      TAUZTO(III)=AMIN1(TAUZTO(III),RSLVR)
196      PRNT(III,13)=TAUZ(III)
197      PRNT(III,15)=TAUZTO(III)

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I N D E X

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198      IF(III.EQ.NI) GO TO 100
199      GO TO 30
200      250 III=III-1
201      IIJ=IIJ-1
202      RETURN
203      260 JUMP=1
204      GO TO 250
205      END
    
```


SYMBOL	-----	REFERENCES	-----
20	- 24 25*	115 116 118	
30	- 26*	199	
70	- 46 48*	56	
80	- 47 53*		
85	- 53WR 54*		
90	- 52 57*		
100	- 61*	198	
105	- 61 71*		
110	- 70 81*		
120	- 45 128*		
130	- 128 130*		
140	- 134WR 135*		
150	- 130 131	132 133 136*	
160	- 137WR 138*		
170	- 136 142*		
175	- 129 148*		
180	- 150* 155		
190	- 150 152*		
195	- 151 157*		
196	- 157 159*		
197	- 158 161*		
198	- 163* 165		
199	- 162 165*		
200	- 44 160	164 167*	
210	- 169 172*		
220	- 175WR 177*		
230	- 172 173	174 175 178*	
240	- 156 171	182 192*	
250	- 181 200*	204	
260	- 167 203*		
1010	- 24 83*		
1020	- 84DO 86*		
1030	- 87 89*		
1033	- 91* 109	112 119	
1035	- 91WR 92*		
1040	- 89 94*		
1045	- 95 96*		
1050	- 95 99*		
1055	- 99 100*		
1060	- 99 103*		
1065	- 103 104*		
1070	- 98 102	106*	
1080	- 103 107*		
1083	- 90 94	108*	
1085	- 108 109*		
1090	- 108 112*		
1100	- 111 114*	123	
1110	- 106 119*		
1115	- 121* 125		
1118	- 122* 127		
1120	- 120 124*		
1130	- 121 126*		
AAN	- 19CO		

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I N D E X

SUBROUTINE TISUB(IE)

PAGE 474

* COMN	-	15*												
* COMT	-	16*												
DEL	-	57=	58	59=	60	151=	162							
DELF	-	600												
DELT	-	1000	38	40	42	54	65	71	74	110=	111=	117=	127=	133
	-	148	175	192	193									
DELTA	-	1800												
DELTSP	-	400	117											
DELTSS	-	300	112	113	124									
DELTST	-	300	119	122	124=	126=								
DELTTO	-	300	109	110	126									
DELZ	-	600												
DIS	-	1800												
DUMX	-	1400												
DUMY	-	1400												
* DUMYR	-	9*												
DWDOT	-	1100												
DWOTS	-	1300												
DWSLTA	-	1300												
DWSLTF	-	1300												
HALL	-	97=	101=	105=	106									
HCO	-	600	59											
HE	-	1600												
HSUBMG	-	2200												
I	-	8400	85	86										
ICHN	-	2000	140=											
IE	-	146	25=	81=	139=									
III	-	1700	24	26=	28	30	34	40	48	49	50	51	64	65
	-	66	67	68	69	71	72	73	74	75	76	77	78	79
	-	80	130	134WR	144	145	146	147	152=	154	155	176WR	183=	186
	-	192	193	194	195	196	197	198	200=					
IIJ	-	1700	27=	29	40	64	65	153=	184=	192	193	201=		
IIS	-	1700	42	43	83=	131	132	137WR	142	143	148	149	150	170=
	-	173	174	178	179	180=								
* INPUTM	-	3*												
* INPUTN	-	4*												
* INPUTT	-	5*												
* INPUTU	-	6*												
* INPUTW	-	7*												
IS1	-	1700												
IS2	-	1700												
JUMP	-	900	44	168=	203=									
KDUMP	-	600												
NBACK	-	900	159=	163=	166=	182	185=							
NCASE	-	200												
NCASES	-	200												
NDISP	-	200												
NEND	-	2200												
NF	-	200												
NI	-	1700	155	198										
NINCPL	-	1700												
NLEWIS	-	200												
NRECON	-	200	120	121										
NSI	-	200												
NSLOT	-	1700	8400											

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I N D E X

SUBROUTINE TISUB(IE)

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SUMDV	-	16C0																		
SUMDVA	-	22C0																		
SUMDV8	-	22C0																		
T	-	18C0																		
TAU	-	16C0	28=	38	47	128	169													
TAUM	-	33=	36	37	188=	190	191													
TAUMNA	-	7C0	72																	
TAUMNB	-	7C0	75																	
TAUMX	-	23EQ	33	188																
TAUMY	-	23EQ	33	62	63	188														
TAUTO	-	17C0																		
TAUTOZ	-	14C0																		
TAUW	-	8C0	32=	34	46	47														
TAUWUP	-	11C0	34=																	
TAUWX	-	14C0	32																	
TAUWY	-	14C0	32																	
TAUZ	-	11C0	28	48=	50	64=	66=	68	71=	72=	73	74=	75=	76						
			77	79	144=	146	192=	194=	196											
TAUZTO	-	11C0	40	49=	51	55=	67=	69	73=	76=	78	80	145=	147						
		193=	195=	197																
TEMP	-	31=	32	33	35	187=	188	189												
TEMP1	-	38=	39=	46	48	144														
TEMP2	-	40=	41=	49	145															
TEMP3	-	42=	43	143																
TEMP4	-	43=	45	136	142															
TEMP5	-	148=	149	157	179															
TEMP6	-	149=	161	165	172	178														
TEST	-	96=	100=	104=	106															
TIME	-	18C0	97	116	120	133	175													
TIMEW	-	10C0																		
TIMEY1	-	4C0	116																	
TIMEY2	-	4C0	115	116																
TISUB	-	1*																		
TOFLAG	-	17C0																		
TSA	-	12C0																		
TSF	-	12C0																		
TSLOTA	-	13C0	179=																	
TSLOTF	-	13C0	143=																	
TSLVW	-	35=	36	37	189=	190	191													
TSLVWV	-	15C0	35	189																
TSLVWY	-	15C0	35	62	63	189														
TST	-	4C0	95	96	120															
U	-	18C0																		
UA	-	12C0																		
UF	-	12C0																		
UT	-	10C0																		
VEH	-	19C0																		
VF	-	11C0																		
VFH	-	19C0																		
VFINI	-	19C0																		
VFN	-	19C0																		
VFPP	-	14C0																		
VIS	-	19C0																		
VP	-	11C0																		
WDOT	-	17C0																		

I N D E X

SUBROUTINE YISUB(IE)

PAGE 477

	WDDID	-	17C0				
	WDUTI	-	10C0				
	WI	-	16C0				
*	WORKA	-	B*				
	WSL0TD	-	12C0				
	WSL0TI	-	12C0				
	WT	-	16C0				
	XBARIH	-	16C0				
	XR	-	16C0				
	ZCALC	-	10C0	30	134WR	154	176WR 186

1	SUBROUTINE TRAN(X,Y,K)	770
2	DIMENSION X(1),Y(1)	780
	CC	800
	C SUBROUTINE TRAN TRANSFERS THE GEOMETRY CONSTANTS FROM THE	820
	C PERMANENT COMMON STORAGE LOCATION TO THE WORKING ARRAY COMMON	830
	C STORAGE LOCATION.	840
	CC	860
3	DO 10 I=1,K	880
4	Y(I)=X(I)	890
5	10 CONTINUE	900
6	RETURN	910
7	END	

INDEX

SUBROUTINE FRAN(X,Y,K)

PAGE 479

SYMBOL	REFERENCES
10	300 5*
1	300 4
K	1AG 300
* RETURN	6*
* FRAN	1*
X	1AG 2DI 4
Y	1AG 2DI 4=

1	SUBROUTINE VFPPSB(IER)	53340
	CC	53390
C	SUBROUTINE VFPPSB DETERMINES THE PORT VOLUME OF EACH CYLINDRICAL	53410
C	SECTION SEGMENT AND SUMS THE SEGMENT PORT VOLUMES TO OBTAIN THE	53420
C	TOTAL CYLINDRICAL SECTION PORT VOLUME.	53430
	CC	53450
2	COMMON/CONSTS/GNOT,PI,PI02,RADIAN	
3	COMMON/INPUTU/DELTA,PA,PHI,HCO,DELTA,KDUMP(72)	
4	COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,	
	1 ALS1,ALS2,ALA,ALB,ALE,AW(5)	
5	COMMON/CUMM/TAUTOZ,HSLVRN,AX(45),AY(45),AINCX,ANOX,REFX,TAUWX,	
	1 DUMX(17),Aincy,ANOY,RFY,TAUWY,DUMY(17),VFPP	
6	IER=0	53470
7	VFPP=VFPP+(AINC-AINCX)*((REFX+RF)*RF+REFX**2)*HCO*3.14159/(3.*HCO)	53480
8	IF(AINC-HCO)10,20,10	53490
9	10 RFX=RF	53500
10	AINCX=AINC	53510
11	GO TO 30	53520
12	20 IER=1	53530
13	30 RETURN	53540
14	END	

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ORIGINAL PAGE IS
OF POOR QUALITY

SYMBOL	REFERENCES
10	8 9*
20	8 12*
30	11 13*
AINC	4C0 7 8 10
AINCX	5C0 7 10=
AINCY	5C0
ALA	4C0
ALB	4C0
ALE	4C0
ALSI	4C0
ALS2	4C0
ANO	4C0
ANOX	5C0
ANOY	5C0
AW	4C0
AX	5C0
AY	5C0
* COMM	5*
* CONSTS	2*
DELF	3C0
DELZ	3C0
DUMX	5C0
DUMY	5C0
GNOI	2C0
HCO	3C0 7 8
IER	1AG 6= 12=
* INPUTU	3*
KDUMP	3C0
PA	3C0
PHI	3C0
P1	2C0
PI02	2C0
RADIAN	2C0
* RETURN	13*
RF	4C0 7 9
RFX	5C0 7 9=
RFY	5C0
RSLVRN	5C0
R2	4C0
R3	4C0
R4	4C0
R5	4C0
R6	4C0
R7	4C0
R8	4C0
TAUTOZ	5C0
TAUW	4C0
TAUWX	5C0
TAUWY	5C0
VFPP	5C0 7=
* VFPPSB	1*
* WORKA	4*

```

1      SUBROUTINE VOLSUB                                82600
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 82720
C      SUBROUTINE VOLSUB IS THE CONTROL ROUTINE WHICH DETERMINES THE 82740
C      INITIAL VOLUME FOR THE BLOCK 3 ANALYSIS OF THE HEAD-END WITH WER 82750
C      (SECTION 5.2.1.4). 82760
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 82780
2      COMMON/CONSTS/GNOT,PI,PID2,RADIAN
3      COMMON/INPUTA/BTAOE,DH1,BH,AOHM,RIG,HHR
4      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,
1      ALS1,ALS2,ALA,ALB,ALE,AW(5)
5      COMMON/WORKRH/RH1(5),HM2,ACG,HHW,VFHO,VCH,ANK(10)
6      COMMON/DUMYS/TWH,BRBB
7      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XHARIN,ASE,AFF,WI,WT,RA,
1      RAO,ALL,AJPP,ASI
8      COMMON/COMJ/VRX,ALITQ,COUNT,VFHEWI,VEX,VR,ASTO,ASIGR
9      COMMON/COMV/VSTR,VSTO,TDMAX,DO1A,DO1B,XMAX,ZMAX,YMAX,ALHO,
1      RDPE1,ROPE2,ROPE3,ALDP
10     COMMON/PARMG/VFH,AAN,VFN,VIS,AIT,SPHDT,SPOND,T,VFINT,VEH,ABTOT
11     COMMON/PARMH/B1E,B0E,AANN,BX,RXX,ASI1,DELLR1,ROPE4,AIE,YPI,ZPI,
1      ARCO,ARCL,ROE1,ALITTL,ZI,AIG,THRI,TTHRO,AOF
12     DIMENSION DIV(5)
13     IF (TAU)50,10,50                                82800
14     10 COUNT=0. 82810
15     DIV(1)=1.5 82820
16     DIV(2)=1.1 82830
17     DIV(3)=1.01 82840
18     DIV(4)=1.001 82850
19     DIV(5)=1.0001 82860
20     VEH=(A1E**2*B1E-AOE**2*BOE)*6.28318/3.-(B1E-B0E)*RIG**2*PI
21     VEX=VEH 82880
22     DO 20 I=1,7 82890
23     20 CALL VSEC(I) 82900
24     I=13 82910
25     CALL VSEC(I) 82920
26     I=I-1 82930
27     IF (I-9)40,30,30 82940
28     40 VFHEWI=VFH 82950
29     50 ASI = 2.*AANN*ASI 82960
30     ASE=ASI 82970
31     VFHO=VEH 82980
32     IF (TAU)270,60,270 82990
33     60 HM2=SQR((RF**2-RIG**2)/BH) 83000
34     VCH=(B1E**2*HM2-HM2**3/3.)*BH**2*3.14159 83010
35     VR=(VFH-VEX+VSTO)-VSTR*2.*ANO 83020
36     IF (VR)310,310,70 83030
37     70 ALITQ=TDMAX 83040
38     IF (B1E-B0E-TAUW)90,90,80 83050
39     80 TWH=TAUW 83060
40     GO TO 100 83070
41     90 TWH=B1E-B0E 83080
42     100 IF (TDMAX-TWH-1.0)120,120,110 83090
43     110 BRBB=1.0 83100
44     GO TO 130 83110
45     120 BRBB=2.0/(TDMAX-TWH) 83120
46     130 IND=0 83130

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47      IF (TDMAX-TWH-1.)140,150,150      83140
48      ALITQ=-ALITQ      83150
49      150  COUNT=COUNT+1.      83160
50      VRX=(BBBB*(TDMAX-TWH)**(ALITQ+1.0))/((ABS(ALITQ)+1.0)*BBBB)+(TWH*(
      XTDMAX-TWH)**ALITQ)/2.0      83170
51      IF (VRX-VR)180,240,160      83180
52      160  IF (IND)190,170,190      83190
53      170  ALITQ=ALITQ/2.0      83200
54      GO TO 150      83210
55      180  IND=1      83220
56      ALITQ=ALITQ*2.0      83230
57      GO TO 150      83240
58      190  DO 230 I=1,5      83250
59      200  COUNT=COUNT+1.      83260
60      VRX=(BBBB*(TDMAX-TWH)**(ALITQ+1.0))/((ABS(ALITQ)+1.0)*BBBB)+(TWH*(
      XTDMAX-TWH)**ALITQ)/2.0      83270
61      IF (VRX-VR)220,240,210      83280
62      210  ALITQ=ALITQ/DIV(I)      83290
63      GO TO 200      83300
64      220  ALITQ=ALITQ*DIV(I)      83310
65      230  CONTINUE      83320
66      240  ALITQ=ALITQ/1.0001      83330
67      IF (ALITQ)260,250,260      83340
68      250  ALHO=0.      83350
69      GO TO 270      83360
70      260  ALHO=(BBBB*(TDMAX-TWH)**ALITQ      83370
71      270  IF (TAU-TWH)290,290,280      83380
72      280  IF (TAU-TDMAX)300,310,310      83390
73      290  ABIGH=TAU*ALHO/TWH      83400
74      ASI=ASI+ABIGR      83410
75      GO TO 310      83420
76      300  ABIGH=(BBBB*(TDMAX-TAU)**ABS(ALITQ)      83430
77      ASI=ASI+ABIGR      83440
78      310  RETURN      83450
79      END      83460

```

SYMBOL	-----	REFERENCES	-----
10	- 13	14*	
20	- 2200	23*	
30	- 25*	27	
40	- 27	28*	
50	- 13	29*	
60	- 32	33*	
70	- 36	37*	
80	- 38	39*	
90	- 38	41*	
100	- 40	42*	
110	- 42	43*	
120	- 42	45*	
130	- 44	46*	
140	- 47	48*	
150	- 47	49*	54 57
160	- 51	52*	
170	- 52	53*	
180	- 51	55*	
190	- 52	58*	
200	- 59*	61	
210	- 61	62*	
220	- 61	64*	
230	- 5800	65*	
240	- 51	61	66*
250	- 67	68*	
260	- 67	70*	
270	- 32	69	71*
280	- 71	72*	
290	- 71	73*	
300	- 72	76*	
310	- 36	72	75 78*
4AN	- 1000		
4ANN	- 1100	29	
AB16R	- 400	73=	74 76= 77
ABS	- 50	60	76
ABTOT	- 1000		
ACG	- 500		
APF	- 700		
AIG	- 1100		
AINC	- 400		
AIT	- 1000		
AJPP	- 700		
AL	- 700		
ALA	- 400		
ALB	- 400		
ALDP	- 900		
ALE	- 400		
ALHD	- 900	68= 70= 73	
ALITQ	- 800	37= 48= 50	53= 56= 60 52= 54= 65= 67 70 76
ALITTL	- 1100		
ALL	- 700		
ALS1	- 400		
ALS2	- 400		

I N D E X

SUBROUTINE VOLSUB

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ANK	-	500																		
ANO	-	400	35																	
AOE	-	1100	20																	
AOHM	-	300																		
ARCO	-	1100																		
ARC1	-	1100																		
ASE	-	700	30=																	
ASI	-	700	29=	30		74=	77=													
AS11	-	1100																		
ASTO	-	800																		
AW	-	400																		
A1E	-	1100	20																	
BBB8	-	600	43=	45=	50	60	70	76												
BH	-	300	33	34																
BOE	-	1100	20	38	41															
BTAOE	-	300																		
Bx	-	1100																		
B1E	-	1100	20	34	38	41														
* COMT	-	7*																		
* COMU	-	8*																		
* COMV	-	9*																		
* CONSTS	-	2*																		
COUNT	-	800	14=	49=	59=															
DELLRI	-	1100																		
DH1	-	300																		
DIV	-	1201	15=	16=	17=	18=	19=	62	64											
DOLA	-	900																		
DO1H	-	900																		
* DUMYS	-	6*																		
GNUT	-	200																		
HE	-	700																		
HHR	-	300																		
HHW	-	500																		
HH2	-	500	33=	34																
I	-	2200	23AG	24=	25AG	26=	27	5d00	62	64										
IND	-	46=	52	55=																
* INPUTA	-	3*																		
* PARMG	-	10*																		
* PARMH	-	11*																		
PI	-	200	20																	
PI02	-	200																		
RA	-	700																		
RADIAN	-	200																		
RAO	-	700																		
RC	-	700																		
* RETURN	-	78*																		
RF	-	400	33																	
RH1	-	500																		
RIG	-	300	20	33																
ROE1	-	1100																		
ROPE1	-	900																		
ROPE2	-	900																		
ROPE3	-	900																		
ROPE4	-	1100																		
RXX	-	1100																		

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43		CALL XHTR(2)	84060
44		ALLQ=ZP1-ZP0	84070
45		VFH=((THRI-THRU)/2.+THRU)*(YP0+YPI)*AANN*ALLQ/2.*(ZP1+ZP0)+VFH	84080
46		VEH=VFH	84090
47		IF(ZP1-RPX)110,240,110	84100
48	110	ZP0=ZP1	84110
49		YP0=YP1	84120
50		THRU=THRI	84130
51		HOLDR=ZP1	84140
52		ZP1=ZP1+DELLR	84150
53		IF(ZP1-RPX)50,50,120	84160
54	120	ZP1=RPX	84170
55		GO TO 50	84180
56	130	KXRSBB=2	84190
57		ZP0=RP1	84200
58		RPZ=RP1	84210
59		XPZ=XP1	84220
60		AZ=A(1)	84230
61		RPX=RP2	84240
62		THRZ=THRI	84250
63		THRU=THRI	84260
64		GO TO 20	84270
65	140	KXRSBB=5	84280
66		ZP0=RP2	84290
67		RPX=RP3	84300
68		THRU=THRI	84310
69		GO TO 20	84320
70	150	KXRSBB=6	84330
71		ZP0=RP3	84340
72		RPZ=RP3	84350
73		XPZ=XP3	84360
74		AZ=A(2)	84370
75		RPX=RP4	84380
76		THRZ=THRI	84390
77		THRU=THRI	84400
78		GO TO 20	84410
79	160	KXRSBB=7	84420
80		ZP0=RP4	84430
81		RPX=RP5	84440
82		THRU=THRI	84450
83		GO TO 20	84460
84	170	ZP0=RP5	84470
85		RPZ=RP5	84480
86		XPZ=XP5	84490
87		KXRSBB=8	84500
88		RPX=RP6	84510
89		AZ=A(3)	84520
90		THRZ=THRI	84530
91		THRU=THRI	84540
92		GO TO 20	84550
93	180	KXRSBB=9	84560
94		ZP0=RP6	84570
95		RPX=RP-TAUW	84580
96		THRU=THRI	84590
97		GO TO 20	84600

I N D E X

SUBROUTINE VSEC(K)

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98	190	KXRSBB=16	84610
99		ZP0=RP9	84620
100		RPX=RP13	84630
101		THRU=0.	84640
102		GO TO 20	84650
103	200	KXRSBB=15	84660
104		ZP0=RP13	84670
105		RPZ=RP13	84680
106		XPZ=XP13	84690
107		AZ=A(5)	84700
108		RPX=RP12	84710
109		THRZ=THRI	84720
110		THRU=THRI	84730
111		GO TO 20	84740
112	210	ZP0=RP12	84750
113		KXRSBB=14	84760
114		RPX=RP11	84770
115		THRU=THRI	84780
116		GO TO 20	84790
117	220	KXRSBB=11	84800
118		ZP0=RP11	84810
119		RPZ=RP11	84820
120		XPZ=XP11	84830
121		AZ=A(4)	84840
122		RPX=RP10	84850
123		THRZ=THRI	84860
124		THRU=THRI	84870
125		GO TO 20	84880
126	230	KXRSBB=10	84890
127		ZP0=RP10	84900
128		RPX=RP-TAUW	84910
129		THRU=THRI	84920
130		GO TO 20	84930
131	240	RETURN	84940
132		END	

SYMBOL	-----	REFERENCES	-----
10	-	12 13*	
20	-	12 17*	64 69 78 83 92 97 107 111 116 125 130
30	-	20 21*	
40	-	20 23*	
50	-	22 24*	53 55
60	-	27 28*	
70	-	27 29*	
80	-	29 30*	
90	-	29 32*	
100	-	31 33*	
110	-	47 48*	
120	-	53 54*	
130	-	12 56*	
140	-	12 65*	
150	-	12 70*	
160	-	12 79*	
170	-	12 84*	
180	-	12 93*	
190	-	12 98*	
200	-	12 101*	
210	-	12 112*	
220	-	12 117*	
230	-	12 126*	
240	-	47 131*	
A	-	4C0 60	74 89 107 121
AAN	-	7C0	
AANN	-	8C0 45	
AHTOT	-	7C0	
AIG	-	8C0	
AINC	-	5C0	
AIT	-	7C0	
AK	-	3C0	
AKK	-	3C0 28	
ALA	-	5C0	
ALB	-	5C0	
ALC	-	4C0	
ALD	-	4C0	
ALE	-	5C0	
ALITTL	-	8C0	
ALL0	-	44= 45	
ALP	-	10C0 41=	
ALS1	-	5C0	
ALS2	-	5C0	
AL11A	-	9C0	
AL3A	-	9C0	
ANO	-	5C0	
AOE	-	8C0	
AOHM	-	2C0	
ARCO	-	8C0 17A6	
ARC1	-	8C0 24A6 33A6	
AS	-	9C0	
ASI1	-	8C0	
AW	-	5C0	

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SUBROUTINE VSEC(K)

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AZ	-	6C0	35	36	60=	74=	89=	107=	121=										
A1E	-	8C0																	
BH	-	2C0																	
BOE	-	8C0	17AG	24AG	33AG														
BRAK	-	9C0																	
BTAGE	-	2C0	17AG	24AG	33AG														
BX	-	8C0	37=	38	39														
B1E	-	8C0																	
B71M	-	4C0																	
B72M	-	4C0																	
B91M	-	4C0																	
B92M	-	4C0																	
* COMR	-	6*																	
* COS	-	35																	
DELLR	-	6C0	19=	20	21	28=	29	30	52										
DELLK1	-	8C0	19																
DH1	-	2C0																	
D1RF	-	3C0																	
DRVRF	-	3C0																	
DS	-	9C0	25=	27	28														
HHR	-	2C0																	
HOLDN	-	9C0	18=	26	51=														
* INPUTA	-	2*																	
* INPUTC	-	3*																	
K	-	1AG	12																
KBRK	-	9C0																	
KGAM	-	10C0																	
KRASBB	-	10C0																	
KVSTR	-	9C0																	
KXRSBB	-	10C0	11=	56=	65=	70=	79=	87=	93=	98=	101=	113=	117=	126=					
* PARMG	-	7*																	
* PARMH	-	8*																	
* PARML	-	9*																	
* PARMQ	-	10*																	
* PARMP	-	11*																	
* RETURN	-	131*																	
RF	-	5C0	95	128															
RIG	-	2C0																	
ROE1	-	8C0																	
ROPE4	-	8C0																	
RPX	-	9C0	15=	20	23	29	32	47	53	54	61=	67=	75=	81=					
	-	88=	95=	100=	108=	114=	122=	128=											
RPZ	-	6C0	34	41	58=	72=	85=	105=	119=										
RP1	-	11C0	15	57	58														
RP10	-	11C0	122	127															
RP11	-	11C0	114	118	119														
RP12	-	11C0	108	112															
RP13	-	11C0	100	104	105														
RP2	-	11C0	61	66															
RP3	-	11C0	67	71	72														
RP4	-	11C0	75	80															
RP5	-	11C0	81	84	85														
RP6	-	11C0	88	94															
RXX	-	8C0																	
RO11	-	4C0																	

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SUBROUTINE VSEC(K)

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	R03	-	400																
	R05	-	400																
	R07	-	400																
	R09	-	400																
	R1	-	400	16															
	R2	-	500																
	R3	-	500																
	R4	-	500																
	R5	-	500																
	R6	-	500																
	R7	-	500																
	R8	-	500																
	R9	-	400	99															
	SPHDT	-	700																
	SPONDT	-	700																
*	SQRT	-	25	34	39	41													
*	TAN	-	36																
	TAUM	-	400																
	TAUM	-	500	95	128														
	TEMP	-	34=	37															
	TEMP2	-	38=	39	40=	41													
	TEMP3	-	39=	41															
	TEMP5	-	35=	41															
	TEMP6	-	36=	37	38	39	40												
	THR1	-	800	45	50	62	63	68	76	77	82	90	91	96	109				
	THRU	-	110	115	123	124	129												
		-	800	14=	45	50=	63=	68=	77=	92=	91=	96=	101=	110=	115=				
		-	124=	129=															
	THR2	-	1100	62=	76=	90=	109=	123=											
	TH1	-	400																
	TH2	-	400																
	TH3	-	400																
	TH4	-	400																
	T10M	-	400																
	T12M	-	400																
	T2M	-	400																
	T4M	-	400																
	T5M	-	400																
	T6M	-	400																
	T7M	-	400																
	T9M	-	400																
	VEH	-	700	45	46=														
	VFH	-	700	45=	46														
	VFINT	-	700																
	VFN	-	700																
	VIS	-	700																
*	VSEC	-	1*																
*	WORKA	-	5*																
*	WORK45	-	4*																
	XPZ	-	600	34	37	41	59=	73=	86=	106=	120=								
	XP1	-	1100	59															
	XP11	-	1100	120															
	XP13	-	1100	106															
	XP3	-	1100	73															
	XP5	-	1100	86															

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I N D E X

SUBROUTINE VSÉC(K)

PAGE 497

#	XRTHR	-	42*	43*													
	X011	-	4C0														
	X03	-	4C0														
	X05	-	4C0														
	X07	-	4C0														
	X09	-	4C0														
	X45	-	4C0														
	X76	-	4C0														
	YPI	-	8C0	24AG	25	33AG	45	49									
	YPO	-	9C0	17AG	25	45	49=										
#	YPSUB	-	17*	24*	33*												
	Y011	-	4C0														
	Y03	-	4C0														
	Y05	-	4C0														
	Y07	-	4C0														
	Y09	-	4C0														
	Y45	-	4C0														
	Y76	-	4C0														
	Z1	-	8C0														
	ZPO	-	9C0	16=	17AG	18	20	21	25	44	45	48=	57=	66=	71=		
			80=	84=	94=	99=	104=	112=	118=	127=							
	ZPI	-	8C0	21=	23=	24AG	25	26=	29	30=	32=	33AG	38	44	45		
			47	48	51	52=	53	54=									

+-----+

1	SUBROUTINE VSTR5	44960
C	CC	45040
C	SUBROUTINE VSTR5 DETERMINE THE INITIAL CORE VOLUME THAT IS	45060
C	PRESENT IN THE HEAD END WITH WEB FOR THE BLOCK 3 ANALYSIS (SECTION	45070
C	5-2.1.4).	45080
C	CC	45100
2	COMMON/WORK45/A(51),R1,R9,TM1,TM2,TM4,TM5,X45,Y45,ALC,X03,Y03,	
1	W03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76,	
2	ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,YAUM,TH2,	
3	TH3,TH4,B71M,B72M,B91M,B92M	
3	COMMON/WORKA/A(ING,AND,RF,TAUW,R2,R3,R4,R5,R6,R7,R8,	
1	ALS1,ALS2,ALA,ALH,ALE,AW(5)	
4	COMMON/XOAWOR/RAA,XRATA,THRA,GAMA1A,GAMA2A,X0A,Y0A,Z0A,X2A,Y2A,	
1	Z2A,X1A,Y1A,Z1A,X3A,Y3A,Z3A,TANGPA,SINTRA,COSTRA,	
2	TANP1A,AAA,HA,CA,OA,BTAOA,SINGAP,COSGA2,SINGA1,	
3	COSGA1,ALTA	
5	COMMON/XOBWOR/RAB,XRATB,THRB,GAMA1B,GAMA2B,X0B,Y0B,Z0B,X2B,Y2B,	
1	Z2B,X1B,Y1B,Z1B,X3B,Y3B,Z3B,TANG2B,SINTRB,COSTRB,	
2	TANP1B,ABH,BR,CB,DB,BTAOB,SINGB2,COSGB2,SINGB1,	
3	COSGB1,ALTB	
6	COMMON/CUMV/VSTR,VSTO,TOMAX,D01A,D01B,XMAX,ZMAX,YMAX,ALHO,	
1	ROPE1,ROPE2,ROPE3,ALDP	
8	COMMON/PARML/HOLDR,AL3A,BRAK,AL11A,AS,HPX,ZP0,YP0,DS,KHRAK,KV5TH	
8	COMMON/PARMO/ALP,KRASBB,XKRSBB,KGAM	
9	C	45110
	GO TO (10,20,20,30,20,40,50,20,20,60),KV5TH	45120
C	SECTOR 1 2 4 5 6 7 9 10 12 13	45130
10	VSTR=VSTR*(Y0A+Y0B)*R2*(ALP-HOLDR)/4.	45140
11	GO TO 70	45150
12	20 VSTR=VSTR*(Y0A+Y0B)*(D01A+D01B)*SQRT((Z0A-Z0B)**2*(X0A-X0B)**2)/4.	45160
13	GO TO 70	45170
14	30 TEMP=X05*(SQRT((D01B+R4)**2-X05**2)-SQRT((D01A+R4)**2-X05**2))	45180
15	VSTR=VSTR*(Y0A+Y0B)*(TEMP-(ALP-HOLDR)*R4)/4.	45190
16	GO TO 70	45200
17	40 TEMP=X07*(SQRT(ABS((D013+R5)**2-X07**2))-SQRT(ABS((D01A+R5)**2-X07	45210
	X**2)))	45220
18	VSTR=VSTR*(Y0A+Y0B)*(TEMP-(ALP-HOLDR)*R5)/4.	45230
19	GO TO 70	45240
20	50 TEMP=X09*(SQRT((D01B+R6)**2-X09**2)-SQRT((D01A+R6)**2-X09**2))	45250
21	VSTR=VSTR*(Y0A+Y0B)*(TEMP-(ALP-HOLDR)*R6)/4.	45260
22	GO TO 70	45270
23	60 VSTR=VSTR*(Y0A+Y0B)*R8*(ALP-HOLDR)/4.	45280
24	70 RETURN	45290
25	END	

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ORIGINAL PAGE IS
OF POOR QUALITY

SYMBOL	-----	REFERENCES	-----
10	-	9 10*	
20	-	9 12*	
30	-	9 14*	
40	-	9 17*	
50	-	9 20*	
60	-	9 23*	
70	-	11 13 16 19 22 24*	
A	-	2C0	
AAAA	-	4C0	
ABB	-	5C0	
* ABS	-	17	
AINC	-	3C0	
ALA	-	3C0	
ALB	-	3C0	
ALC	-	2C0	
ALD	-	2C0	
ALDP	-	6C0	
ALE	-	3C0	
ALHO	-	6C0	
ALP	-	8C0 10 15 18 21 23	
ALS1.	-	3C0	
ALS2	-	3C0	
ALTA	-	4C0	
ALTB	-	5C0	
AL11A	-	7C0	
AL3A	-	7C0	
ANO	-	3C0	
AS	-	7C0	
AW	-	3C0	
BA	-	4C0	
BB	-	5C0	
BHAK	-	7C0	
BTA0A	-	4C0	
BTA0B	-	5C0	
B71M	-	2C0	
B72M	-	2C0	
B91M	-	2C0	
B92M	-	2C0	
CA	-	4C0	
CB	-	5C0	
* COMV	-	6*	
COSGA1	-	4C0	
COSGA2	-	4C0	
COSGB1	-	5C0	
COSGB2	-	5C0	
COSTRA	-	4C0	
COSTRB	-	5C0	
DA	-	4C0	
DB	-	5C0	
D01A	-	6C0 12 14 17 20	
D01B	-	6C0 12 14 17 20	
DS	-	7C0	
GAMA1A	-	4C0	

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SUBROUTINE VSTRSH

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GAMA1B	-	500					
GAMA2A	-	400					
GAMA2B	-	500					
HOLDR	-	700	10	15	18	21	23
KHRAK	-	700					
KGAM	-	800					
KRASBB	-	800					
KVSTR	-	700					
KXRSBB	-	800					
* PARML	-	7*					
* PARMO	-	8*					
RAA	-	400					
RAB	-	500					
* RETURN	-	24*					
RF	-	300					
ROPE1	-	600					
ROPE2	-	600					
ROPE3	-	600					
RPX	-	700					
R011	-	200					
R03	-	200					
R05	-	200					
R07	-	200					
R09	-	200					
R1	-	200					
R2	-	300	10				
R3	-	300					
R4	-	300	14	15			
R5	-	300	17	18			
R6	-	300	20	21			
R7	-	300					
R8	-	300	23				
R9	-	200					
SINGA1	-	400					
SINGA2	-	400					
SINGB1	-	500					
SINGB2	-	500					
SINTRA	-	400					
SINTRB	-	500					
* SQR1	-	12	14	17	20		
TANG2A	-	400					
TANG2B	-	500					
TANP1A	-	400					
TANP1B	-	500					
TAUM	-	200					
TAUW	-	300					
TOMAX	-	600					
TEMP	-	14=	15	17=	18	20=	21
THRA	-	400					
THRB	-	500					
TH1	-	200					
TH2	-	200					
TH3	-	200					
TH4	-	200					
T10M	-	200					

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SUBROUTINE VSTRSR

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T12M	-	2C0								
T2M	-	2C0								
T4M	-	2C0								
T5M	-	2C0								
T6M	-	2C0								
T7M	-	2C0								
T9M	-	2C0								
VSTO	-	6C0								
VSTR	-	6C0	10=	12=	15=	18=	21=	23=		
* VSTRSR	-	1*								
* WORKA	-	3*								
* WORK45	-	2*								
XMAX	-	6C0								
XOA	-	4C0	12							
* XOAWOR	-	4*								
XOB	-	5C0	12							
* XOBWOR	-	5*								
XRATA	-	4C0								
XRATB	-	5C0								
X011	-	2C0								
X03	-	2C0								
X05	-	2C0	14							
X07	-	2C0	17							
X09	-	2C0	20							
X1A	-	4C0								
X1B	-	5C0								
X2A	-	4C0								
X2B	-	5C0								
X3A	-	4C0								
X3B	-	5C0								
X45	-	2C0								
X76	-	2C0								
YMAX	-	6C0								
YOA	-	4C0	10	12	15	18	21	23		
YOB	-	5C0	10	12	15	18	21	23		
YPO	-	7C0								
Y011	-	2C0								
Y03	-	2C0								
Y05	-	2C0								
Y07	-	2C0								
Y09	-	2C0								
Y1A	-	4C0								
Y1B	-	5C0								
Y2A	-	4C0								
Y2B	-	5C0								
Y3A	-	4C0								
Y3B	-	5C0								
Y45	-	2C0								
Y76	-	2C0								
ZMAX	-	6C0								
ZOA	-	4C0	12							
ZOB	-	5C0	12							
ZPO	-	7C0								
Z1A	-	4C0								
Z1B	-	5C0								

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SUBROUTINE VSTRSB

PAGE 498

Z2A	-	400
Z2B	-	500
Z3A	-	400
Z3B	-	500

1	SUBROUTINE XLIN (A,B,N,X,Y,L)	
2	REAL*4 A(N),B(N)	390
3	IF ((X .LT. A(1)) .OR. (X .GT. A(N))) GO TO 2	410
4	K = 0	400
5	1 K = K + 1	420
6	IF (X .GT. A(K+1)) GO TO 1	430
7	Y = B(K) + (X - A(K)) * (B(K+1) - B(K)) / (A(K+1) - A(K))	440
8	GO TO 10	
9	2 WRITE(6,3) L,X	
10	3 FORMAT(1H ,10X,'X IS OUT OF RANGE IN XLIN',3X,'CALL NO.=',	
11	\$12,' ',3X,'IND. VAR.=',F11.3)	
12	10 RETURN	
	END	

INDEX

SUBROUTINE XLIN (A,B,N,X,Y,L)

PAGE 500

SYMBOL	REFERENCES
1	5*
2	3
3	9WR
10	8
A	1AG 2RL 3 6 7
B	1AG 2RL 7
K	4= 5= 6 7
L	1AG 9WR
N	1AG 2RL 3
* RETURN	11*
X	1AG 3 6 7 9WR
* XLIN	1*
Y	1AG 7=

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1      SUBROUTINE XRSUB(KXRSUB)                                58210
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 58320
C      SUBROUTINE XRSUB DETERMINES THE X-COORDINATE OF A GENERAL POINT ON 58340
C      THE PERIMETER OF A SECTOR IN THE END SECTIONS (SECTION 5.2.3.2). 58350
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 58370
2      COMMON/WORK45/A(5),R1,R9,TH1,T2M,T4M,T5M,X45,Y45,ALC,X03,Y03.
1          R03,X05,Y05,R05,X07,Y07,R07,T6M,T7M,T12M,X76,Y76.
2          ALD,X09,Y09,R09,X011,Y011,R011,T10M,T9M,TAUM,TH2.
3          TH3,TH4,B71M,B72M,B91M,B92M
3      COMMON/WORKA/AINC,ANO,RF,TAUW,R2,R3,R4,R5,R6,R7,R8.
1          ALS1,ALS2,ALA,ALB,ALE,AW(5)
4      COMMON/COMT/TAU,RC,SUMDV,XR,HE,AL(13),XBARI,M,ASE,AFF,W1,WT,RA.
1          RAO,ALL,AJPP,ASI
5      COMMON/COMX/COSA(5),SINA(5),DTAUX,DTAUWX
C
6      GO TO (10,20,30,40,50,60,70,130,80,90,100,110,120),KXRSUB    58380
7      10  TEMP1=(R1+R2)**2                                           58390
8          TEMP2=2.*(R1+R2)                                           58400
9          TEMP3=(R2-TAU)**2                                           58410
10         TEMP4=RA**2                                               58420
11         TEMP2=(TEMP4+TEMP1-TEMP3)/TEMP2                            58430
12         XR=SQRT(TEMP4-TEMP2**2)                                    58440
13         GO TO 130                                                 58450
14         20  TEMP1=R2-(R1+R2)*SINA(1)-TAU                          58460
15         TEMP2=SINA(1)*SQRT(RA**2-TEMP1**2)                        58470
16         XR=TEMP1*COSA(1)+TEMP2                                    58480
17         GO TO 130                                                 58490
18         30  TEMP1=R03**2                                           58500
19         TEMP2=RA**2                                               58520
20         TEMP3=TEMP1+TEMP2-(R3-TAU)**2                            58530
21         TEMP4=Y03*SQRT(4.*TEMP1*TEMP2-TEMP3**2)                  58540
22         XR=(TEMP3*X03+TEMP4)/(2.*TEMP1)
23         GO TO 130
24         40  TEMP1=T2M-TAU-(ALA/COSA(1)+R2+R11)*SINA(2)            58560
25         TEMP2=SINA(2)*SQRT(RA**2-TEMP1**2)                        58570
26         XR=TEMP1*COSA(2)+TEMP2                                    58580
27         GO TO 130                                                 58590
28         50  TEMP1 = R05**2                                           58600
29         TEMP2=RA**2                                               58620
30         TEMP3=TEMP1+TEMP2-(R4+TAU)**2                            58630
31         TEMP2=Y05*SQRT(4.*TEMP1*TEMP2-TEMP3**2)
32         XR=(X05*TEMP3-TEMP2)/(2.*TEMP1)
33         GO TO 130
34         60  TEMP1=X07*COSA(3)-TAU-R5-(Y07*SINA(3))                58640
35         TEMP2=SINA(3)*SQRT(RA**2-TEMP1**2)                        58680
36         XR=COSA(3)*TEMP1+TEMP2                                    58690
37         GO TO 130                                                 58700
38         70  TEMP1=R07**2                                           58720
39         TEMP2=RA**2                                               58730
40         TEMP3=TEMP1+TEMP2-(R5+TAU)**2
41         TEMP2=Y07*SQRT(4.*TEMP1*TEMP2-TEMP3**2)
42         XR=(X07*TEMP3-TEMP2)/(2.*TEMP1)
43         GO TO 130
44         80  TEMP1=R09**2                                           58760
45         TEMP2=RA**2                                           58780

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45      TEMP3=TEMP1+TEMP2-(R6+TAU)**2          5A790
46      TEMP4=Y09*SQRT(4.*TEMP1*TEMP2-TEMP3**2)
47      XR=(X09*TEMP3-TEMP4)/(2.*TEMP1)
48      GO TO 130
49      90      TEMP1=X09*COA(4)-TAU-R6-Y09*SINA(4)          5A820
50      TEMP2=SINA(4)*SQRT(RA**2-TEMP1**2)          5A840
51      XR=COA(4)*TEMP1+TEMP2          5A850
52      GO TO 130          5A860
53      100     TEMP1=R011**2
54      TEMP2=RA**2          5A8A0
55      TEMP3=TEMP1+TEMP2-(R7+TAU)**2          5A890
56      TEMP4=Y011*SQRT(4.*TEMP1*TEMP2-TEMP3**2)
57      XR=(X011*TEMP3+TEMP4)/(2.*TEMP1)
58      GO TO 130          5A920
59      110     TEMP1=R8-TAU-SINA(5)*(R8+R9)          5A930
60      TEMP2=SINA(5)*SQRT(RA**2-TEMP1**2)          5A940
61      XR=COA(5)*TEMP1+TEMP2          5A950
62      GO TO 130          5A960
63      120     TEMP1=R8+R9          5A970
64      TEMP3=(R8-TAU)**2          5A980
65      TEMP1=(RA**2+TEMP1**2-TEMP3)/(2.*TEMP1)          5A990
66      XR=SQRT(RA**2-TEMP1**2)          5A000
67      130     RETURN          5A010
68      END
69

```

I N D E X

SUBROUTINE XRSUB(KXRSUB)

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SYMBOL	-----	REFERENCES	-----
10	- 6	7*	
20	- 6	14*	
30	- 6	18*	
40	- 6	24*	
50	- 6	28*	
60	- 6	34*	
70	- 6	38*	
80	- 6	44*	
90	- 6	50*	
100	- 6	54*	
110	- 6	60*	
120	- 6	64*	
130	- 6	13	17 23 27 33 37 43 49 53 59 63 68*
A	- 2C0		
AFF	- 4C0		
AINC	- 3C0		
AJPP	- 4C0		
AL	- 4C0		
ALA	- 3C0	24	
ALB	- 3C0		
ALC	- 2C0		
ALD	- 2C0		
ALE	- 3C0		
ALL	- 4C0		
ALS1	- 3C0		
ALS2	- 3C0		
ANU	- 3C0		
ASE	- 4C0		
ASI	- 4C0		
AW	- 3C0		
B71M	- 2C0		
B72M	- 2C0		
B91M	- 2C0		
B92M	- 2C0		
* COMT	- 4*		
* COMX	- 5*		
COSA	- 5C0	16	24 26 34 36 50 52 62
UTAUWX	- 5C0		
UTAU	- 5C0		
HE	- 4C0		
KXRSUB	- 1AG	6	
RA	- 4C0	10	15 19 25 29 35 39 45 51 55 61 66
	- 67		
RA0	- 4C0		
RC	- 4C0		
* RETURN	- 68*		
RF	- 3C0		
R011	- 2C0	54	
R03	- 2C0	18	
R05	- 2C0	28	
R07	- 2C0	38	
R09	- 2C0	44	
R1	- 2C0	7	8 14 24

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I N D E X

SUBROUTINE XRSUB (KXRSUB)

PAGE 504

R2	-	300	7	8	9	14	24							
R3	-	300	20											
R4	-	300	30											
R5	-	300	34	40										
R6	-	300	46	50										
R7	-	300	56											
R8	-	300	60	64	65									
R9	-	200	60	64										
* SINA	-	500	14	15	24	25	34	35	50	51	60	61		
* SQRT	-	12	15	21	25	31	35	41	47	51	57	61	67	
* SUMDV	-	400												
* TAU	-	400	9	14	20	24	30	34	40	46	50	56	60	65
* TAUW	-	200												
* TEMP1	-	300												
		7=	11	14=	15	16	18=	20	21	22	24=	25	26	28=
		30	31	32	34=	35	36	38=	40	41	42	44=	46	47
		48	50=	51	52	54=	56	57	58	60=	61	62	64=	66=
		67												
* TEMP2	-	8=	11=	12	15=	16	19=	20	21	25=	26	29=	30	31=
		32	35=	36	39=	40	41=	42	45=	46	47	51=	52	55=
		56	57	61=	62									
* TEMPJ	-	9=	11	20=	21	22	30=	31	32	40=	41	42	46=	47
		48	56=	57	58	65=	66							
* TEMP4	-	10=	11	12	21=	22	47=	48	57=	58				
* TH1	-	200												
* TH2	-	200												
* TH3	-	200												
* TH4	-	200												
* T10M	-	200												
* T12M	-	200												
* T2M	-	200	24											
* T4M	-	200												
* T5M	-	200												
* T6M	-	200												
* T7M	-	200												
* T9M	-	200												
* W1	-	400												
* WORKA	-	3*												
* WORK45	-	2*												
* WT	-	400												
* XBARIH	-	400												
* XR	-	400	12=	16=	22=	26=	32=	36=	42=	48=	52=	58=	62=	67=
* XRSUB	-	1*												
* X011	-	200	58											
* X03	-	200	22											
* X05	-	200	32											
* X07	-	200	34	42										
* X09	-	200	48	50										
* X45	-	200												
* X76	-	200												
* Y011	-	200	57											
* Y03	-	200	21											
* Y05	-	200	31											
* Y07	-	200	34	41										
* Y09	-	200	47	50										

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I N D E X

SUBROUTINE XRSUH(KXRSUR)

PAGE 505

Y45 - 2CO
Y76 - 2CO

INDEX

SUBROUTINE XFSUBB

PAGE 507

44		GO TO 170	85890
45	150	XRAT=R8*SIN(1.570795-A(5))+ALP*SINA(5)	85900
46		GO TO 170	85910
47	160	XRAT=SQRT(RAT**2-((RAT**2*(R8+R9)**2-R8**2)/(2.*P(R8+R9)))**2)	85920
48	170	RETURN	85930
49		END	

SYMBOL	-----	REFERENCES	-----
10	-	8 9*	
20	-	8 11*	
30	-	8 13*	
40	-	8 15*	
50	-	8 17*	
60	-	8 21*	
70	-	8 23*	
80	-	8 27*	
90	-	8 30*	
100	-	8 33*	
110	-	8 36*	
120	-	8 38*	
130	-	8 40*	
140	-	8 42*	
150	-	8 45*	
160	-	8 47*	
170	-	10 12 14 16 20 22 26 29 32 35 37 39 41	
	-	44 46 48*	
A	-	3C0 11 45	
AINC	-	4C0	
ALA	-	4C0 13	
ALB	-	4C0	
ALC	-	3C0	
ALD	-	3C0	
ALE	-	4C0 38	
ALP	-	7C0 11 13 15 21 36 38 40 45	
ALS1	-	4C0	
ALS2	-	4C0	
AND	-	4C0	
AW	-	4C0	
B71M	-	3C0	
B72M	-	3C0	
B91M	-	3C0	
B92M	-	3C0	
* COMX	-	5*	
* CONSTS	-	2*	
COSA	-	5C0 13 15 21 27 28 36 38 40	
DTAUWX	-	5C0	
DTAUX	-	5C0	
GAMA1	-	6C0	
GAMA2	-	6C0	
GNOT	-	2C0	
KGAM	-	7C0	
KRASBB	-	7C0	
* KXRSBB	-	7C0 8	
* PARMH	-	6*	
* PARMO	-	7*	
P1	-	2C0	
P102	-	2C0	
KADIAN	-	2C0	
KAT	-	6C0 9 17 18 19 23 24 25 28 30 31 33 34	
	-	42 43 47	
* RETURN	-	48*	

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1      SUBROUTINE XRTHR(K)                                85950
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 86000
C      SUBROUTINE XRTHR IS A SET UP SUBROUTINE THAT USES SUBROUTINE 86020
C      XRSUBB TO OBTAIN THE X-COORDINATE OF A POINT LOCATED ON THE 86030
C      PERIMETER OF A SECTOR IN THE BLOCK 2B ANALYSIS OF THE HEAD END 86040
C      WITH WEB. THE ANGLE THETAR1 BETWEEN THE Z AXIS AND A LINE FROM THE 86050
C      MOTOR AXIS TO A GENERAL POINT IN A SECTOR IS ALSO DETERMINED 86060
C      (SECTION 5.2.1.3). 86070
CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC 86090
2      COMMON/DUMYT/XRI
3      COMMON/PARMH/BIE,BOE,A4V4,BX,RXX,AS11,DELLRI,ROPE4,A1E,YPI,ZP1,
1      ARCD,ARCI,ROEI,ALITTL,ZI,A16,THRI,THRO,AGE
4      COMMON/PARMH/RAT,XRAT,THR,GAMA1,GAMA2,Z1AT
5      GO TO(10,20),K
6      10  RAT=ZP1
7          CALL XRSUBB
8          XRI=XRAT
9          GO TO 30
10     20  THRI=ACOS(SQRT(ZP1**2-XRI**2)/ZP1)
11     30  RETURN
12     END

```

86110
86120
86130
86140
86150
86160
86170

SYMBOL	-----	REFERENCES	-----
10	-- 5 6*		
20	-- 5 10*		
30	-- 9 11*		
AANN	-- 3CO		
THE VARIABLE- ACOS -IS USED BEFORE IT IS DEFINED			
ACOS	-- 10		
AIG	-- 3CO		
ALITTL	-- 3CO		
AOE	-- 3CO		
ARCO	-- 3CO		
ARCI	-- 3CO		
ASII	-- 3CO		
AIE	-- 3CO		
BOE	-- 3CO		
HX	-- 3CO		
BIE	-- 3CO		
DELLRI	-- 3CO		
* DUMYT	-- 2*		
GAMA1	-- 4CO		
GAMA2	-- 4CO		
K	-- 1AG 5		
* PAKMH	-- 3*		
* PARMH	-- 4*		
RAT	-- 4CO 6=		
* RETURN	-- 11*		
ROE1	-- 3CO		
ROPE4	-- 3CO		
RXX	-- 3CO		
* SQR	-- 10		
THK	-- 4CO		
THRI	-- 3CO 10=		
THRO	-- 3CO		
XRAT	-- 4CO 8		
XHI	-- 2CO 8= 10		
* XHSUBB	-- 7*		
* XRTHR	-- 1*		
YPI	-- 3CO		
ZI	-- 3CO		
ZPI	-- 3CO 6 10		
ZLAT	-- 4CO		

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1      SUBROUTINE YPSUB(ZP,BTAE,BOE,YP,ARC,K)      86190
C      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC  86210
C      SUBROUTINE YPSUB DETERMINES THE Y-COORDINATE OF THE POINTS PO AND  86230
C      P3 WHICH ARE LOCATED ON THE SURFACE OF THE INNER AND OUTER      86240
C      ELLIPSOIDS RESPECTIVELY FOR THE BLOCK 2 ANALYSIS OF THE HEAD END  86250
C      WITH WEB (SECTION 5.2.1.2).      86260
C      CCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC  86280
2      GO TO (30,10,40),K      86300
3      10 IF (YP)30,20,30      86310
4      20 ARC=1.570795      86320
5      GO TO 50      86330
6      30 ARC=1.570795-ACOS(ZP/SQRT(YP**2*BTAE**4+ZP**2))      86340
7      GO TO 50      86350
8      40 YP=SQRT(BOE**2-ZP**2/BTAE**2)      86360
9      50 RETURN      86370
10     ,      ENH

```


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FUNCTION ZEROOV (X)

PAGE 515

1	FUNCTION ZEROOV (X)	720
2	ZEROOV = 0.0	730
3	IF (X .NE. 0.0) ZEROOV = 1. / X	740
4	RETURN	750
5	END	

SYMBOL		REFERENCES			
"	RETURN	-	4*		
x		-	1AG	3	
"	ZEROVV	-	1*	2=	3=

86390
86510
86470
86480
86490
86510

86530
86540
86550
86560
86570
86580
86590
86600

SYMBOL	-----	REFERENCES	-----
10	-	3	4*
20	-	3	6*
30	-	5	10*
AAA	-	6=	9AG
AANN	-	2CO	
ATG	-	2CO	
ALITTL	-	2CO	7 8
AOE	-	2CO	
ARCO	-	2CO	
ARCI	-	2CO	6 7
ASII	-	2CO	
AIE	-	2CO	4 6
BBB	-	7=	9AG
BOE	-	2CO	
DX	-	2CO	
DIE	-	2CO	6 8
CCC	-	8=	9AG
DELLRI	-	2CO	
* PARMH	-	2*	
* RETURN	-	10*	
MOE1	-	2CO	
MOPE4	-	2CO	
XXX	-	2CO	
* TAN	-	6	7
* TDGRE	-	9*	
THRI	-	2CO	
THRO	-	2CO	
YPI	-	2CO	3
ZI	-	2CO	4= 9AG
* ZISUB	-	1*	
ZPI	-	2CO	

SYMBOL		ROUTINES IN WHICH THE SYMBOL IS USED									
A	-	FDGRE	GMSUB	LPDAPS	LPTO	MNCHN1	MNCHN2	MNCHN3	PCHWRT	PLNCNS	PLNLCS
AAA	-	RASUB	RASUBB	SCI	SECTOR1	S2SK	TGORE	VSEC	XLIN	XRSUB	
AAN	-	P3SUB	RCSUB	ZISUB							
AANA	-	LOOKUP	MNCHN4								
AANB	-	LOOKUP	MNCHN4	VSCE							
AANN	-	LOOKUP	MNCHN4	NSCE							
ABCYL	-	AIGSUB	HUNSUB	MTISUB	PT1AA	SECTOR1	SDID13	VOLSUB	VSEC		
ABEND	-	MNCHN4	SEGSUB								
ABHD	-	MNCHN2									
ABHD	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN3	MNCHN4	PCHWRT		
ABIG	-	FDGRE									
ABIGR	-	SECTOR1	VOLSUB								
ABN	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN4	PCHWRT			
ABNA	-	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN4	PCHWRT				
ABNB	-	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN4	PCHWRT				
ABS	-	ACOS	AESUB	AIBST	AIBSUB	ALRSUB	ENDCSB	FDGRE	MNCHN1	MNCHN4	NSCE
	-	PLNLCS	SETPH	SLOT	SECTOR1	SUBSON	TISUB	VOLSUB	VSTRSB		
ABSLOT	-	IBMOUT	SEGSUB	SLOT							
ABSLTA	-	IBMOUT	SLOT								
ABSLIF	-	IBMOUT	SLOT								
ABTOT	-	IBMOUT	MNCHN4	RBSTSB							
ACCEL	-	AIBST	IBM	MNCHN1	SLOT						
ACCELT	-	AIBST	INPT								
ACGA	-	MSISUB	MTISUB								
ACGB	-	MSISUB	MTISUB								
ACOS	-	AESUB	AFPSUB	AIGSUB	ALRSUB	ASIN	AWESUB	ENDCSB	FDGRE	GAMA25	LPTO
	-	NSCE	PLNCNS	PISUB	P3SUB	RASUB	RASUBB	SDID13	THETAR	XRTHR	YPSUB
ADEL	-	MNCHN4									
AEE	-	AEPSUB	AESUB	SETPH	SUBSON						
AEEA	-	AEPSUB	AESUB								
AEEB	-	AEPSUB	AESUB								
AENT	-	NSCE	SUBSON								
AENTAS	-	SUBSON									
AEPSUB	-	AESUB									
AER	-	ENDCSB									
AESUB	-	AEPSUB									
AEXAS	-	SUBSON									
AFO	-	AFPSUB									
AFB	-	AESUB	LPDAPS	LPTO	MNCHN2	SEGSUB	SLOT				
AFHI	-	SEGSUB	SLOT								
AFIT	-	MNCHN4									
AFITC	-	MNCHN4									
AFP	-	AFPSUB	LPDAPS	LPTO	MNCHN2						
AFPSUB	-	LPDAPS									
AFRPL	-	MNCHN1	MNCHN4								
AFS	-	LPDAPS									
AFX	-	SEGSUB									
AFY	-	IBM	SEGSUB								
AGI	-	MACH									
AHH	-	LOOKUP	MNCHN3	MNCHN4							
AHO	-	MNCHN3	MNCHN4								
AIBCYL	-	IBMOUT	MNCHN4	SEGSUB							
AIBST	-	AIBSUB	MNCHN4								

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AIBSUB	-	AIBST	MNCHN4	SEGSUB						
AIG	-	AIGSUB	CTOR1							
AIGSUB	-	CTOR1								
AINC	-	LPTO	MNCHN1	MNCHN2	MNCHN3	MODTSB	SETPH	TISUB	VFPPSR	
AINCHI	-	AIBST	SEGSUB	SLOT						
AINCIN	-	IBM	INPT	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSB	SEGSUB	SETPH
AINCIN	-	MNCHN1								
AINCPL	-	IBM	INPT	MNCHN1						
AINCW	-	AIBST	LPTO	MNCHN2						
AINCX	-	LPTO	MNCHN4	MODTSB	SEGSUB	SETPH	RBSUB	SD1D13	SEGSUB	SLOT
AINCY	-	LPTO	MNCHN4	MODTSB	SEGSUB	TISUB	TISUB	VFPPSR		
AIPCYL	-	IBMOUT	MNCHN4	SEGSUB						
AIR1	-	FDGRE								
AIR2	-	FDGRE								
AIR3	-	FDGRE								
AIR4	-	FDGRE								
AIT	-	SETPH	TISUB							
AITST	-	IBM	INPT	TISUB						
AITVAC	-	IBMOUT								
AJBB	-	ASTSUB	IBMOUT	MNCHN2	PT1AA	RGISUB	SD1D13			
AJBBA	-	MNCHN2	PT1AA	SD1D13						
AJBHB	-	MNCHN2	PT1AA	SD1D13						
AJBH	-	PT1AA	SD1D13							
AJBHEU	-	IBMOUT	LOOKUP	MNCHN3	PT1AA	SD1D13				
AJBHEW	-	MNCHN3								
AJBHN	-	MNCHN3	CTOR1	SZSK						
AJBHU	-	MNCHN3	MTISUB	RGISUB						
AJBNUZ	-	IBMOUT	LOOKUP	PT1AA	SD1D13					
AJBNZA	-	LOOKUP								
AJBNZB	-	LOOKUP								
AJPH	-	PT1AA	SD1D13							
AJPHEU	-	IBMOUT	LOOKUP	MNCHN3	PT1AA	SD1D13				
AJPHEW	-	MNCHN3								
AJPHN	-	MNCHN3	CTOR1	SZSK						
AJPHU	-	MNCHN3	MTISUB	RGISUB						
AJPNUZ	-	IBMOUT	LOOKUP	PT1AA	SD1D13					
AJPNZA	-	LOOKUP								
AJPNZB	-	LOOKUP								
AJPP	-	AFPSUB	ASTSUB	IBMOUT	MNCHN2	PT1AA	RGISUB	SD1D13		
AJPPA	-	MNCHN2	PT1AA	SD1D13						
AJPPB	-	MNCHN2	PT1AA	SD1D13						
AJPX	-	SD1D13								
AJPXA	-	SD1D13								
AJPXB	-	SD1D13								
AJSTB	-	ASTSUB	MNCHN3							
AJSTP	-	ASTSUB	MNCHN3							
AK	-	INPT								
AKEEP	-	FDGRE								
AKG	-	IBM	RBSUB	RVSUB						
AKGY	-	IBM	MNCHN2	PT1AA	SD1D13	SEGSUB				
AKGYHI	-	SEGSUB								
AKGYP	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	PCHWRT			
AKGYPX	-	MNCHN2								
AKGYX	-	MNCHN4	SEGSUB							
AKGY	-	MNCHN4	SEGSUB							

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AKK	-	INPT	SCI	SCTOR1	SCTOR2	S2SK	VSFC						
AKR	-	CONV	IBM	INPT	MNCHN4	RBSTSB	RBSUB	RBSUB	RBVSUB	SEGSUB			
AKRADJ	-	MNCHN4	RBSUB										
AKRFB	-	MNCHN3											
AKRFP	-	MNCHN3											
AKRH	-	IBM	INPT	MNCHN4									
AKRHLD	-	CONV	MNCHN4										
AKRIB	-	MNCHN3											
AKRIP	-	MNCHN3											
AKRN	-	IBM	INPT	MNCHN4									
AKRST	-	AIBST	CONV	IBM	MNCHN1	MNCHN4	RBSTSB	RBSUB					
AKRTAU	-	INPT	RHSTSB	RBSUB	SEGSUB								
AKRTMP	-	RBSUB											
AKRTO	-	RBSUB	SEGSUB										
AKRTOM	-	SEGSUB											
AKRTOW	-	SEGSUB											
AKRTOX	-	SEGSUB											
AKR2	-	RBSUB											
AKR3B	-	RBSUB											
AKR4	-	RBSUB											
AKSLOI	-	IBM	INPT	RBSUB									
AKU	-	IBM	INPT	RBSUB	RBVSUB								
AL	-	AFPSUB	ASESUB	AWESUB	LPDAPS	LPTO	PT1AA	RASUB	RASUBH	SCI	SCTOR1		
	-	SEGSUB											
ALA	-	IBM	INPT	LPDAPS	PLNCNS	RASUB	RASUBH	SCTOR1	XRSUB	XRSUBH			
ALADM	-	SCI											
ALAMUA	-	AEESUB	AWESUB										
ALAMIN	-	AEESUB	AWESUB										
ALAMN	-	SETPH											
ALB	-	IBM	INPT	LPDAPS	PLNCNS	SCTOR1							
ALBDM	-	SCI											
ALC	-	LPDAPS	PLNCNS	PLNLCS	RASUB	RASUBH	SCI	SCTOR1					
ALD	-	LPDAPS	PLNCNS	PLNLCS	RASUB	SCI	SCTOR1						
ALDP	-	RUPS8	SCI										
ALF	-	IBM	INPT	LPDAPS	PLNCNS	RASUB	RASUBH	SCTOR1	XRSUBH				
ALFDM	-	SCI											
ALFE	-	ENDCSB											
ALFEM	-	ENDCSB											
ALHO	-	HDNSUB	VOLSUB										
ALITBE	-	AWESUB	ENDCSB										
ALITU	-	HDNSUB	MNCHN1										
ALITTL	-	LBSUB	ZISUB										
ALL	-	AEESUB	PT1AA	RASUB	SDID1J								
ALLIT	-	FDGNE											
ALLQ	-	VSEC											
ALP	-	AFPSUB	BRAKSB	GAMSUB	LPDAPS	MNCHN2	P1SUB	RASUBH	SCI	SCTOR1	SFGSUB		
	-	S2SK	VSEC	VSTRSH	XHSUBH								
ALPHI	-	SEGSUB											
ALPPL	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN4	PCHWRT	SEGSUB				
ALPPLX	-	MNCHN2											
ALPRP	-	LOOKUP	MNCHN1	MNCHN4									
ALPSLV	-	MNCHN2											
ALPX	-	MNCHN4	SEGSUB										
ALPY	-	MNCHN4	SEGSUB										
ALQ	-	SCTOR1	S2SK										

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APA	-	IBMOUT	SLOT						
APF	-	IBMOUT	SLOT						
APHI	-	AIBST	AIBSUB	MNCHN4	SEGSUB	SLOT			
APORT	-	IBM	INPT	MNCHN2	MNCHN4	NSCE	PCHWRT		
APORTN	-	MNCHN4							
APORTX	-	MNCHN2							
APROJ	-	MNCHN4							
APX	-	MNCHN4	SEGSUB						
APY	-	MNCHN4	SEGSUB						
AK	-	AESUB	AFPSUB	MACH	NSCE				
AKC	-	YPSUB							
AKCO	-	MSISUB	MTISUB	SCTOR1	S2SK	VSEC			
AKCI	-	LBSUB	MSISUB	MTISUB	SCTOR1	S2SK	VSEC	ZISUB	
AKEA	-	AFPSUB							
AKINPT	-	MACH							
AKN	-	AIGSUB							
ARO	-	AFSUB							
AKSSUB	-	AESUB							
AKI	-	MACH							
AK2	-	MACH							
AS	-	SCTOR1	S2SK						
ASE	-	AEP SUB	ASESUB	ASTSUB	HDNSUB	MNCHN2	VOL SUB		
ASEA	-	AEP SUB	ASESUB	MNCHN2					
ASEB	-	AEP SUB	ASESUB	MNCHN2					
ASESUB	-	ENOCSS	MNCHN2						
ASHOLD	-	SCTOR1							
ASI	-	MNCHN3	SCI	SCTOR1	S2SK	VOL SUB			
ASIN	-	AFPSUB	PLNCNS						
ASII	-	SCI	SCTOR1						
ASLVN	-	AFPSUB	LPDAPS	LPTO	MNCHN1	MNCHN2			
ASTO	-	HDNSUB	MNCHN1	SCTOR1					
ASTSUB	-	MNCHN3							
ASUBB	-	FUGRE							
ASUBC	-	SCI							
AI	-	AFPSUB	IBMOUT	MODTSB	NSCE	RBSTSB	SETPH		
ATMAX	-	SETPH							
ATO	-	AESUB							
ATT	-	AESUB							
AV1	-	AFPSUB	LPDAPS	MNCHN1					
AV2	-	AFPSUB	LPDAPS	MNCHN1					
AV3	-	AFPSUB	LPDAPS	LPTO	MNCHN1				
AV3X	-	LPTO							
AV3Y	-	LPTO							
AW	-	ASESUB	AWESUB						
AWEA	-	ASESUB	AWESUB						
AWEB	-	ASESUB	AWESUB						
AWESUB	-	ASESUB							
AX	-	LPTO	MNCHN1	MNCHN4	MODTSB	SEGSUB	TISUB		
AY	-	LPTO	MNCHN1	MNCHN4	MODTSB	SEGSUB	TISUB		
AZ	-	S2SK	VSEC						
A1	-	IBMOUT							
A1A	-	NSCE	SUBSON						
A1B	-	LOOKUP	MNCHN4	NSCE	SUBSON	PISUB	PJSUB	VOL SUB	ZISUB
A1E	-	GAMA25	HDNSUB	MSISUB	MTISUB				
A2	-	IBMOUT							

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CAE	-	ENDCSB	RCSUB																	
CAFIT	-	MNCHN4																		
CBB	-	AIBSUB																		
CBE	-	ENDCSB	RCSUB																	
CBETA	-	NSCE	SUBSON																	
CC	-	AIBSUB																		
CCC	-	P3SUB	RCSUB	ZISUB																
CCCE	-	ENDCSB	RCSUB																	
CCVE	-	ENDCSB	RCSUB																	
CDCE	-	ENDCSB	RCSUB																	
CDVE	-	ENDCSB	RCSUB																	
CECE	-	ENDCSB	RCSUB																	
CEMPC	-	SETPH																		
CEVE	-	ENDCSB	RCSUB																	
CFC	-	SETPH																		
CFO	-	SETPH																		
CFOL	-	IBM	IBMOUT	SETPH																
CFPROP	-	IBMOUT																		
C6CYL	-	IBMOUT																		
CKDUMP	-	INPT	MNCHN4																	
CKTIME	-	IBM	MNCHN4	RBSUB																
CLOPS	-	AIBST	CONV	MNCHN4	SETPH															
CM	-	INPT	MNCHN4	SETPH																
CODET	-	SETPH																		
COMA	-	AIBST	AIBSUB	IBM	IBMOUT	MNCHN1	MNCHN4	MODTSB	NSCE	RBSTSB	RBSUB									
		SEG SUB	SETPH	SLOT	SUBSON	TISUB														
COMB	-	IBMOUT	LOOKUP	LPDAPS	MNCHN1	MNCHN2	MNCHN3	MODTSB	PTIAA	SC TORI										
		S D I O 13	SETPH	SZSK																
COMC	-	MNCHN1	MNCHN2	MNCHN3	MSISUB	MTISUB	RG ISUB	SC TORI	SZSK											
COMD	-	ASTS UB	MNCHN2	.MNCHN3																
COME	-	MNCHN1	MSISUB	MTISUB																
COMF	-	MSISUB	SC TORI																	
COMG	-	AIBST	AIBSUB	ASESUB	ASTS UB	H DNSUB	IBMOUT	LOOKUP	L PD APS	L PT O	MNCHN1									
		MNCHN4	NSCE	R BST SB	R BSUB	SEG SUB	SETPH	S LOT	T ISUB											
COMM	-	AIBST	MNCHN1	MNCHN4																
COMI	-	IBMOUT																		
COMJ	-	IBM	IBMOUT	MNCHN1	SLOT	TISUB														
COMK	-	IBM	IBMOUT	SEG SUB	SLOT	TISUB														
COML	-	AF PSUB	MNCHN1	MNCHN2	PLNC NS															
COMM	-	L P T O	MNCHN1	MNCHN																

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COMX	-	MNCHN1	MNCHN2	MNCHN3	PLNCNS	RASUB	RASUBB	CTOR1	XRSUB	XRSUBB	
COMY	-	AFPSUB	LPDAPS	MNCHN1							
COMZ	-	AFPSUB	LPDAPS	LPTO	MNCHN1						
CONSTS	-	ACOS	AFPSUB	AIBST	AIBSUB	AIGSUB	AWESUB	ENDCSB	GAMA2S	GAMSUR	IBM
		IBMOUT	INPT	LPDAPS	LPTO	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSB	MSISUB
		MTISUB	NSCE	PLNCNS	PT1AA	PISUB	RASUB	RASUBB	RBSTSB	RGISUB	SCI
		CTOR1	SDID13	SEGSUB	SETPH	SLOT	SUBSON	VFPPSB	VOLSUR	XRSUBB	
CONV	-	SETPH									
COS	-	AFPSUB	AIGSUB	ENDCSB	FDGRE	LPTO	MSISUB	MTISUB	NSCE	PLNCNS	POSUR
		PISUB	P3SUB	RASUB	RASUBB	SCI	CTOR1	SETPH	S2SK	VSEC	
COSA	-	MNCHN1	PLNCNS	RASUB	RASUBB	CTOR1	XRSUB	XRSUBB			
COSGM1	-	POSUB	PISUB	P3SUB							
COSGM2	-	POSUB									
CUSTHR	-	POSUB									
COUNT	-	HDNSUB	MNCHN1	VOLSUB							
CRP	-	AIBST	IBM	INPT							
CRT	-	AIBST	IBM	INPT							
CRW	-	IBM	INPT	SETPH							
CSCDEF	-	INPT	MNCHN4	RBSTSB							
CSTAR	-	INPT	MNCHN4	RBSTSB	SETPH						
CSTR	-	INPT	MNCHN4	RBSTSB							
CIB	-	NSCE									
DAP	-	AIBST									
DAPH1	-	AIBST									
DATA	-	RBSTSB									
DATLOC	-	INPT									
DE	-	INPT	SETPH								
DEED	-	AIBST	CONV	SETPH							
DEL	-	TISUB									
DELDI	-	MODTSB									
DELF	-	IBMOUT	INPT	MNCHN3	MNCHN4	MSISUB	MTISUB	NSCE	PT1AA	RBSTSB	RASUR
		RGISUB	SDID13	SEGSUB	SETPH	SLOT					
DELF X	-	SETPH									
DELH	-	AWESUB	ENDCSB	HESUB	IBM	INPT					
DELL	-	AESUB	ASESUB	ENDCSB							
DELL1	-	PT1AA	SDID13								
DELL0	-	ENDCSB	HDNSUB	SCI							
DELL01	-	HDNSUB	SCI								
DELLP	-	SETPH									
DELLR	-	ENDCSB	CTOR1	S2SK	VSEC						
DELLR1	-	HDNSUB	CTOR1	S2SK	VSEC						
DELL3	-	AFPSUB	LPDAPS								
DELL7	-	AIBST	IBMOUT	MNCHN1	MNCHN4	MODTSB	NSCE	RBSTSB	RASUR	SEGSUB	SETPH
		SLOT	SUBSON	TISUB							
DELTA	-	AIBST	AIBSUB	MNCHN4	RBSUB	SEGSUB	SLOT				
DELTSP	-	IBM	INPT	TISUB							
DELTSS	-	IBM	INPT	MNCHN4	TISUB						
DELTST	-	AIBST	IBM	INPT	MNCHN4	RBSTSB	TISUB				
DELITO	-	IBM	INPT	TISUB							
DELOWF	-	SETPH									
DEL2	-	AIBST	INPT	MNCHN1	SEGSUB						
DEL3	-	AFPSUB	LPDAPS	RASUB							
DEL7	-	LPDAPS	RASUB								
DE1	-	ENDCSB	MNCHN1	MNCHN2	MNCHN3						
DH1	-	IBM	INPT	MNCHN1	MNCHN2	MNCHN3					

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DIFAB	-	CONV					
DIFAKH	-	CONV					
DIS	-	CONV	SETPH				
DISB	-	CONV	SETPH				
DIV	-	VOLSUB					
DLRF	-	ASESUB	ENDCSH	INPT	PT1AA		
DLTMP	-	AIBSUB					
DLTWTM	-	MNCHN2	MNCHN3				
DN1	-	INPT	MNCHN1	MNCHN2			
DO1A	-	ROPSB	SCI	VSTRSB			
DO1B	-	SCI	VSTRSB				
DO3	-	SCI					
DP	-	AIBST	SLOT				
DPHOT	-	R8STSB					
DPK	-	SCI					
DPRA	-	DPRASH	SCI				
DPRASH	-	SCI					
DPS	-	SCI					
DPSA	-	DPRASH	SCI				
DRVRF	-	INPT					
DS	-	SCTOR1	S2SK	VSEC			
DS1	-	S2SK					
DS2	-	S2SK					
DT	-	AIBST	INPT	MODTSB	NSCE	SETPH	SLOT
DTAU	-	IBM	INPT	MNCHN2	MNCHN3		
DTAUW	-	IBM	INPT	MNCHN2	MNCHN3		
DTAUWX	-	MNCHN2	MNCHN3				
DTAUX	-	MNCHN2	MNCHN3				
DTINT	-	MNCHN4	MODTSB	SETPH			
DUMX1	-	SEGSUB					
DUMX2	-	SEGSUB					
DUMYA	-	ASESUB					
DUMYB	-	AFPSUB					
DUMYC	-	AIBST	MNCHN1				
DUMYD	-	AIBSUB	NSCE				
DUMYG	-	CONV	MNCHN4				
DUMYJ	-	MNCHN3					
DUMYK	-	MNCHN4					
DUMYL	-	MNCHN4	R8STSB				
DUMYM	-	IBM	MNCHN1	MNCHN4	RBSUB		
DUMYN	-	SCI					
DUMYO	-	SCTOR1					
DUMYP	-	IBM	SEGSUB				
DUMYQ	-	CONV	SETPH				
DUMYR	-	MNCHN4	TISUB				
DUMYS	-	VOLSUB					
DUMYT	-	XRTHR					
DUMYU	-	MODTSB					
DUMYV	-	IBM	INPT	LINK2			
DUMYW	-	LOOKUP	MNCHN4				
DUMYX	-	NSCE					
DUM1	-	PLNCNS					
DUM2	-	PLNCNS					
DUM3	-	PLNCNS					
DUM4	-	PLNCNS					

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GAMA1A	-	ASUBC	HASUBC								
GAMA1B	-	BSUBC	HBSUBC								
GAMA2	-	ASUBC	BSUBC	GAMA2S	HAPSB	HASUBC	HPSB	HBSUBC	POSUB	P3SUB	
GAMA2A	-	ASUBC	HASUBC								
GAMA2B	-	BSUBC	HBSUBC								
GAMA2S	-	ASUBC	BSUBC	HAPSB	HASUBC	HPSB	HBSUBC				
GAMA2U	-	P1SUB									
GAMSUB	-	ASUBC	BSUBC	HAPSB	HASUBC	HPSB	HBSUBC				
GAM1AP	-	HAPSB									
GAM1BP	-	HPSB									
GAM2AP	-	HAPSB									
GAM2BP	-	HPSB									
GCR	-	HBSUB									
GECON	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSH	PCHWRT	PLNLCS
GEORUN	-	IBM	INPT	LINK2							
GETUAT	-	HBSUB									
GM1	-	SETPH									
GNOT	-	ATBST	ATBSUB	IBM	IBMOUT	MNCHN3	MNCHN4	MSISUB	MTISUB	NSCE	PT1AA
		HBSUB	RGISUB	SD1013	SEGSUB	SETPH	SLOT	SUBSON			
GP1	-	SETPH									
HALT	-	TISUB									
HAPSB	-	SCI									
HASUB	-	SCI									
HPSB	-	SCI									
HBSUB	-	SCI									
HCO	-	ATBST	IBMOUT	MNCHN1	MNCHN2	MSISUB	MTISUB	PT1AA	SD1013	SEGSUB	TISUB
		VFPSPB									
HCR	-	PT1AA	SD1013								
HDNSUB	-	MNCHN3									
HE	-	AESUB	AWESUB	HESUB	MNCHN1	PT1AA	SD1013				
HEA	-	AESUB	AWESUB	HESUB	PT1AA	SD1013					
HEB	-	AESUB	AWESUB	HESUB	PT1AA	SD1013					
HEFC	-	AWESUB									
HEI	-	AESUB	PT1AA	SD1013							
HEIA	-	AESUB	PT1AA	SD1013							
HEIB	-	AESUB	PT1AA	SD1013							
HEO	-	AWESUB	ENDCSB	HESUB							
HER	-	AWESUB	ENDCSB	HESUB							
HESUB	-	AESUB	AWESUB	PT1AA	SD1013						
HE1	-	AWESUB	ENDCSB	HESUB							
HE2	-	AWESUB	ENDCSB								
HHR	-	IBM	INPT	HBSUB							
HH2	-	VOLSUB									
HULUN	-	BRKSB	SCI	SCTOR1	S2SK	VSEC	VSTRSB				
HRH	-	RBSUB									
HSUBMD	-	AWESUB									
HSUBMG	-	AESUB	AWESUB	ENDCSB	HESUB	INPT	MNCHN2	MNCHN2	MNCHN3	MNCHN4	MODTSH
I	-	IBM	IBMOUT	INPT	LOOKUP	LPDAP5	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSH
		PCHWRT	PLNCNS	PT1AA	RBSUB	SCTOR2	SEGSUB	SETPH	TISUB	TRAN	VOLSUB
IBDATA	-	INPT									
IBMOUT	-	MNCHN4									
IBN	-	INPT									
ICHN	-	ATBST	ASUBC	BSUBC	GAMA2S	HAPSB	HASUBC	HPSB	HBSUBC	HDNSUB	IBM
		IBMOUT	LINK1	LINK2	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSH	NSCE	RHSUB
		HBSUB	SCI	SEGSUB	SETPH	SLOT	TISUB				

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ICHOKE	-	NSCE	SUBSON								
ICOUNT	-	MNCHN4	SLOT								
IDISP	-	INPT									
IE	-	AIBST	AIBSUB	ASTSUB	IBMOUT	MNCHN4	MODTSB	SEGSUB	SETPH	SLOT	TISUB
IEND	-	MNCHN4	RBSUB								
IER	-	ENDCSB	PLNLCS	SETPH	VFPPSB						
IERROR	-	MNCHN1									
IEX	-	PT1AA	SD1013								
IFLAG	-	AIBST	MNCHN4	SETPH							
ILI	-	AIBST	AIBSUB	ASESUB	ASTSUB	HDNSUB	IBM	LPDAPS	LPTO	MNCHN1	MNCHN4
			MODTSB	RBSUB	SEGSUB	TISUB					
IIJ	-	ASESUB	ASTSUB	HDNSUB	IBM	MNCHN1	MNCHN4	MODTSB	SEGSUB	SLOT	TISUB
IIS	-	IBM	IBMOUT	MNCHN1	MNCHN4	SEGSUB	SLOT	TISUB			
IK	-	MODTSB									
IN	-	INPT									
IND	-	VOLSUB									
INPT	-	LINK1									
INPUTA	-	AIGSUB	ASTSUB	GAMA2S	HDNSUB	IBM	INPT	MNCHN1	MNCHN2	MNCHN3	MSISUB
		MTISUB	PLNCNS	RBSUB	RGISUB	SCTOR1	SETPH	S2S<	VOLSUB	VSEC	
INPUTB	-	INPT	MNCHN1	MNCHN2							
INPUTC	-	ASESUB	ENDCSB	INPT	MNCHN2	PT1AA	SCI	SCTOR1	SCTOR2	S2S<	VSEC
INPUTD	-	CONV	IBM	INPT	MNCHN4	RBSTSB					
INPUTE	-	CONV	IBM	INPT	MNCHN4	RBSTSB	RBSUB	RBSUB	SEGSUB		
INPUTF	-	AIBST	CONV	IBM	INPT	MNCHN4	RBSTSB	RBSUB	SEGSUB	SETPH	
INPUTG	-	AIBST	AIBSUB	IBM	IBMOUT	INPT	MNCHN4	NSCE	HBSTSB	SEGSUB	SFTPH
		SLOT	SUBSON								
INPUTH	-	IBM	INPT	MNCHN1	MNCHN4						
INPUTI	-	IBM	IBMOUT	INPT	MNCHN4	MODTSB	NSCE	SETPH			
INPUTJ	-	IBM	INPT	MODTSB							
INPUTK	-	IBM	INPT	MNCHN4							
INPUTL	-	IBM	IBMOUT	INPT	LINK1	PCHWRT					
INPUTM	-	AIBST	AIBSUB	IBM	IBMOUT	INPT	MNCHN1	MNCHN4	MODTSB	RBSTSB	RBSUB
		SEGSUB	SETPH	SLOT	TISUB						
INPUTN	-	IBM	INPT	RBSTSB	TISUB						
INPUTO	-	IBM	IBMOUT	INPT	LOOKUP	LPDAPS	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSB
		NSCE	PCHWRT	PLNLCS	SCTOR1	SEGSUB	S2S<				
INPUTP	-	AIBST	IBM	INPT							
INPUTQ	-	AIBST	IBM	INPT	MNCHN1	SETPH					
INPUTR	-	IBM	INPT	SETPH							
INPUTS	-	IBM	INPT	MNCHN2	MNCHN3						
INPUTT	-	IBM	IBMOUT	INPT	MNCHN1	SLOT	TISUB				
INPUTU	-	AIBST	AIBSUB	ASESUB	ASTSUB	CONV	HDNSUB	IBM	IBMOUT	INPT	LPTO
		MNCHN1	MNCHN2	MNCHN3	MNCHN4	MSISUB	NSCE	PT1AA	RBSTSB	RBSUB	
		RGISUB	SD1013	SEGSUB	SETPH	SLOT	SUBSON	VFPPSB			
INPUTV	-	INPT	MNCHN1	MNCHN2	MNCHN4						
INPUTW	-	INPT	LOOKUP	MNCHN2	TISUB						
INPUT1	-	IBM	IBMOUT	INPT	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSB	PCHWRT	SCI
		SEGSUB	SETPH								
INPUT2	-	IBM	INPT	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSB			
INPUT3	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSB	PCHWRT	PLNLCS
INPUT4	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN3	MNCHN4	NSCE	PCHWRT	SEGSUB
INTREC	-	LINK1									
IOPT	-	MNCHN4	NSCE	SUBSON							
IOUT	-	IBMOUT									
IPASS	-	NSCE									

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NWEB	-	MNCHN2									
NWRTAD	-	IBM	LINK1	PCHWRT							
OOPS	-	SLOT									
OUTPUT	-	IBMOUT									
P	-	AIBST	AIBSUB	ASESUB	ASTSUB	FDGRE	HDNSUB	MNCHN4	NSCE	RBSUB	SEGSUB
		SETPH	SLOT								
PA	-	IBM	INPT	MNCHN4	NSCE	RBSUB	SETPH	SLOT	SUBSON		
PARMA	-	AFPSUB	LPDAPS	LPTO	MNCHN1	MNCHN2	SEGSUB				
PARMAA	-	AIBST	AIBSUB	IBMOUT	INPT	MNCHN4	NSCE	RHSTSH	SEGSUB	SETPH	SLOT
		SUBSON									
PARMAB	-	AEPSUB	AESUB	ASESUB	AWESUB	ENDCSB	HESUB	IBM	IBMOUT	INPT	LOOKUP
		MNCHN1	MNCHN2	MNCHN4	PCHWRT	PT1AA	RBSUB	SD1013	TISUB		
PARMAC	-	AEPSUB	AESUB	ASESUB	AWESUB	ENDCSB	HESUB	IBM	INPT	PT1AA	SD1013
PARMAD	-	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN4	PCHWRT				
PARMAE	-	MNCHN2	PT1AA	SD1013							
PARMAF	-	PT1AA	SD1013								
PARMAG	-	INPT	MNCHN1	NSCE							
PARMAH	-	IBM	INPT	LINK2	MNCHN1	NSCE					
PARMAI	-	ENDCSB	LOOKUP	MNCHN1	MNCHN4	NSCE					
PARMAJ	-	LOOKUP	MNCHN4	NSCE							
PARMAK	-	MNCHN4	NSCE	SUBSON							
PARMAL	-	MNCHN4	NSCE								
PARMAM	-	INPT	LOOKUP								
PARMAN	-	INPT	LOOKUP	MNCHN4	NSCE	SUBSON					
PARMB	-	AIBST	AIBSUB	ASESUB	ASTSUB	CONV	ENDCSB	HDNSUB	IBM	IBMOUT	INPT
		LOOKUP	LPDAPS	LPTO	MNCHN1	MNCHN2	MNCHN4	MODTSH	NSCE	RHSTSH	RHSUB
		SEGSUB	SETPH	SLOT	SUBSON	TISUB					
PARMC	-	AFPSUB	LPDAPS	MNCHN1	RASUB						
PARMD	-	AESUB	ASESUB	ASTSUB	IBM	IBMOUT	MNCHN1	MNCHN2	MNCHN4	PT1AA	RGISUB
		SD1013									
PARME	-	IBM	LPDAPS	MNCHN1	PT1AA	SD1013					
PARMF	-	AIBST	AIBSUB	ASESUB	ASTSUB	CONV	HDNSUB	IBM	IBMOUT	LPTO	MNCHN1
		MNCHN2	MNCHN4	MODTSH	NSCE	PT1AA	RHSTSH	RBSUB	SD1013	SEGSUB	SETPH
		SLOT	SUBSON	TISUB							
PARMG	-	AIBST	IBMOUT	LOOKUP	MNCHN1	MNCHN3	MNCHN4	RHSTSH	SETPH	TISUB	VOLSUB
		VSEC									
PARMH	-	AIGSUB	GAMA2S	HDNSUB	LBSUB	MNCHN1	MSISUB	MTISUB	POSUB	PT1AA	PISUB
		P3SUB	RHSUB	RGISUB	ROE1SH	SCI	SECTOR1	SD1013	SETPH	S2SK	VOLSUB
		VSEC	XRTHR	ZISUB							
PARMI	-	IBM	IBMOUT	MNCHN1	MNCHN4	SEGSUB					
PARMJ	-	MNCHN1	MNCHN3	MSISUB	MTISUB						
PARMK	-	AIBST	CONV	IBM	IBMOUT	MNCHN1	MNCHN4	SETPH			
PARML	-	BRASB	IBM	MNCHN1	SCI	SECTOR1	S2SK	VSEC	VSTRSB		
PARMM	-	ASUBC	BSUBC	GAMA2S	GAMSUB	HAPSBC	HASUBC	HAPSBC	HRSUBC	MNCHN1	POSUB
		PISUB	P3SUB	RASUBH	XRSUBB	XRTHR					
PARMN	-	OPRASH	MNCHN1	SCI							
PARMO	-	AFPSUB	BRASB	GAMSUB	IBM	LPDAPS	MNCHN1	MNCHN2	PISUB	RASUBB	SCI
		SEGSUB	SEGSUB	S2SK	VSEC	VSTRSB	XRSUBB				
PARMP	-	MNCHN1	SECTOR1	S2SK	VSEC						
PARMQ	-	LOOKUP	MNCHN1	MNCHN4							
PARMR	-	IBM	MNCHN4	RBSUB	SEGSUB	SLOT					
PARMS	-	AIBST	ASUBC	BSUBC	CONV	GAMA2S	HAPSBC	HASUBC	HAPSBC	HRSUBC	HDNSUB
		IBM	IBMOUT	LINK1	LINK2	MNCHN1	MNCHN2	MNCHN3	MODTSH	NSCE	
		RBSUB	RBSUB	RBSUB	SCI	SEGSUB	SETPH	SLOT	TISUB		
PARMU	-	MNCHN1	SETPH								

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	THETAR	XRSUBB	XRTHR							
RAX	- AESUB									
RB	- MNCHN4	NSCE	RBSTSB	RBSUB	SEGSUB	TISUB				
RBFLAG	- CONV	IBM	INPT	RBSTSB						
RBI	- RBSUB	SEGSUB								
RBIG	- FDGRE									
RBRPL	- MNCHN4									
RBSLOT	- RBSUB	SLOT								
RBSLTA	- IBM	IBMOUT	SLOT	TISUB						
RBSLTF	- IBM	IBMOUT	SLOT	TISUB						
RBSTSB	- MNCHN4	RBSUB								
RBSUB	- MNCHN4	NSCE	SEGSUB	SLOT						
RBSUBB	- MNCHN1									
RBZ	- ASESUB	ASTSUB	HDNSUB	MNCHN1	MNCHN4	NSCE	SEGSUB	TISUB		
RBZTO	- MNCHN1	MNCHN4	NSCE	SEGSUB	TISUB					
RB1A	- NSCE									
RB1B	- NSCE									
RB2A	- NSCE									
RB2B	- NSCE									
RB7	- SEGSUB									
RB7HI	- SEGSUB									
RB8	- SEGSUB									
RB8HI	- SEGSUB									
RC	- AESUB	AWESUB	HESUB	MNCHN1	MNCHN2	RCSUB				
RCG	- PT1AA	SD1013								
RCGA	- PT1AA	SD1013								
RCGB	- PT1AA	SD1013								
RCGO	- MSISUB	MTISUB								
RCSUB	- ASESUB	MNCHN2	MNCHN3							
RETURN	- ACOS	ALPSUB	AESUB	AFPSUB	AIBST	AIBSUB	AIGSUB	AIRSUB	ARSSUB	ASFSUB
	ASIN	ASTSUB	AESUB	AWESUB	BRASB	BSUBC	CONV	DRASB	ENDCSB	FGRE
	GAMA2S	GAMSUB	HAPSUC	HASUBC	HAPSUC	HASUBC	HDNSUB	HFSUB	IBM	IBMOUT
	INPT	LHSUB	LINK1	LOOKUP	LOOKUP	LPDAPS	LPTO	MACH	MNCHN1	MNCHN2
	MNCHN3	MNCHN4	MODTSB	MSISUB	MTISUB	NSCE	PCHWRT	PLNCNS	PLNCS	POSUB
	PT1AA	P1SUB	P3SUB	RASUB	HASUBB	RBSTSB	RBSUB	RBSUBB	RCSUB	RGISUB
	ROE1SB	ROPSB	SCI	SCTOR1	SCTOR2	SD1013	SEGSUB	SETPH	SLOT	SUB1
	SUBSON	S2SK	TDGRE	THETAR	TISUB	TRAV	VFPSSH	VOLSUB	VSEC	VSTPSA
	XLIN	XRSUB	XRSUBB	XRTHR	YPSUB	ZERODV	ZISUB			
RE1	- AESUB	AWESUB	ENDCSB	HESUB	MNCHN1					
RE2	- AWESUB	ENDCSB	HESUB	RCSUB						
RF	- AFPSUB	AIBST	ASESUB	ASTSUB	AWESUB	ENDCSB	GAMA2S	HDNSUB	HESUB	IBM
	INPT	LPDAPS	LPTO	MNCHN4	PLNCNS	PT1AA	RCSUB	RGISUB	RDE1SB	SCTOR1
	SD1013	SEGSUB	SETPH	SLOT	S2SK	VFPSSH	VOLSUB	VSEC		
RFDM	- MNCHN2									
RFHI	- SEGSUB	SLOT								
RFI	- SEGSUB	SETPH								
RFX	- LPTO	SEGSUB	SETPH	VFPSSH						
RFY	- LPTO	SEGSUB								
RGF	- MNCHN3	RGISUB								
RQFB	- MNCHN3	RGISUB								
RGI	- MNCHN3	RGISUB								
RQIB	- MNCHN3	RGISUB								
RGISUB	- MNCHN3									
RGYP	- LOOKUP	MNCHN4								
RHOLD	- ASTSUB	RGISUB								

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RHOIMP	-	NSCE					
RHOTOL	-	INPT	SETPH				
RHOIB	-	NSCE					
RH1	-	MNCHN1	MNCHN2	MNCHN3			
RIG	-	AIGSUB	IBM	INPT	MNCHN1	RGISUB	SCTOR1
RLIT	-	RCSUB					VOLSUB
RMOIE	-	MNCHN2					
RMOIHU	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	MNCHN3
RMOIN	-	IBM	INPT	LOOKUP	MNCHN1	MNCHN2	PCHWRT
RMOINA	-	INPT	LOOKUP	MNCHN1	MNCHN2	PCHWRT	
RMOINB	-	INPT	LOOKUP	MNCHN1	MNCHN2	PCHWRT	
RN1	-	MNCHN1	MNCHN2				
ROE1	-	MSISUB	MTISUB	RDE1SB	SCTOR1	S2SK	
ROE1SB	-	SCTOR1	S2SK				
ROOTM	-	FDGRE					
ROO11	-	FDGRE					
ROO12	-	FDGRE					
ROO13	-	FDGRE					
ROO14	-	FDGRE					
ROPE1	-	ROPSB	SCI				
ROPE2	-	ROPSB	SCI				
ROPE3	-	ROPSB	SCI				
ROPE4	-	PISUB	SCI				
ROPSB	-	SCI					
RPX	-	S2SK	VSEC				
RP2	-	S2SK	VSEC				
RP1	-	SCTOR1	S2SK	VSEC			
RP10	-	SCTOR1	S2SK	VSEC			
RP11	-	SCTOR1	S2SK	VSEC			
RP12	-	SCTOR1	S2SK	VSEC			
RP13	-	SCTOR1	S2SK	VSEC			
RP2	-	SCTOR1	S2SK	VSEC			
RP3	-	SCTOR1	S2SK	VSEC			
RP4	-	SCTOR1	S2SK	VSEC			
RP5	-	SCTOR1	S2SK	VSEC			
RP6	-	SCTOR1	S2SK	VSEC			
RR1	-	FDGRE					
RR2	-	FDGRE					
RR3	-	FDGRE					
RR4	-	FDGRE					
RS	-	AFPSUB					
RSLOTA	-	SEGSUB	SLOT				
RSLOTF	-	SEGSUB	SLOT				
RSLVH	-	LPDAPS	LPTO	RBSUB	SEGSUB	TISUB	
RSLVHN	-	MNCHN1	SEGSUB	TISUB			
RSLVHV	-	AFPSUB	LPDAPS	LPTO			
RSLVHX	-	SEGSUB					
RSLVHY	-	SEGSUB					
RT	-	ALRSUB	ASESUB				
RV1	-	AFPSUB	LPDAPS				
RV2	-	AFPSUB	LPDAPS				
RV3	-	AFPSUB	LPDAPS				
RV4	-	AFPSUB	LPDAPS				
RV5	-	AFPSUB	LPDAPS	LPTO			
RV5X	-	LPTO					

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SKF	-	IBMOUT									
SLIT	-	RCSUB									
SLOPE	-	AIBST	MACH	VSC							
SLOT	-	SEGSUB									
SLTBKN	-	IBM	INPT	MNCHN1	SLOT	TISUB					
SLTFLG	-	IBM	MNCHN4	RBSUB	SEGSUB	SLOT					
SLVA	-	MNCHN2									
SPHDT	-	SETPH									
SPONUT	-	SETPH									
SGHT	-	ACUS	AESUB	AFPSUB	AIBST	AIBSUB	AIGSUB	ALRSUB	ANSSUB	AWESUB	HRAKSB
		DPRASB	ENDCSB	FDGPE	GAMA2S	HESUB	INPT	LPTD	MNCHN3	MNCHN4	MSISUB
		MTISUB	NSCE	PLNCNS	POSUB	PT1AA	PLSUB	P3SUB	RASUB	RASUB9	R6ISUB
		SCI	SCTOR1	S01013	SFGSUB	SETPH	SLOT	SURSON	SPSK	TDGHE	THEIAR
		VOLSUB	VSEC	VSTRSB	XRSUB	XRSUBH	XRTTR	YPSUB			
STOYS1	-	AIBST	IBM	INPT	MNCHN4	RBSTSB	RBSUB	SEGSUB	TISUB		
STFLAG	-	AIBST	AIBSUB	IBM	MNCHN4	MODT5B	RBSUB	SEGSUB	SETPH	SLOT	TISUB
STO	-	SURSON									
STOP	-	INPT	LINK1	LINK2	MACH	SETPH	TISUB				
SUBSON	-	NSCE									
SUMDV	-	AEPUB	ASESUB	ASTSUB	AWESUB	ENDCSB	HONSUB	MNCHN1	MNCHN2	MNCHN3	
SUMDVA	-	AEPUB	ASESUB	AWESUB	MNCHN1	MNCHN2					
SUMDVB	-	AEPUB	ASESUB	AWESUB	MNCHN1	MNCHN2					
SVALP	-	MNCHN4									
SWDUTN	-	SETPH									
S2SK	-	SCTOR2									
T	-	AIBST	AIBSUB	MNCHN4	NSCE	SEGSUB	SETPH	SLOT			
TAN	-	AFPSUB	LRSUB	PLNCNS	SCI	SCTOR1	S2SK	VSEC	TISUB		
TANGM2	-	POSUB	P3SUB								
TANPH1	-	P3SUB									
TAU	-	AESUB	AFPSUB	AIGSUB	ASESUB	ASTSUB	AWESUB	BRAKSB	ENDCSB	HONSUB	HESUB
		LOOKUP	LPDAPS	LPTD	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MSISUB	MTISUB	PT1AA
		RASUB	RCSUB	RUPSH	SCI	SCTOR1	S01013	SEGSUB	SPSK	TISUB	V01 SUB
		XRSUB									
TAUAKK	-	INPT	MNCHN4	RBSTSB	RPSUB	SEGSUB					
TAU40	-	LPDAPS	MNCHN2	MNCHN3	S01013						
TAUDUM	-	SEGSUB									
TAUEND	-	MNCHN2									
TAUE0	-	ENDCSB									
TAUE1	-	ENDCSB									
TAUHD	-	ASTSUB									
TAULST	-	SCTOR1									
TAUM	-	ENDCSB	MNCHN2	PLNCNS	SCI	TISUB					
TAUMAX	-	SEGSUB									
TAUMNA	-	LOOKUP									
TAUMNB	-	INPT	MNCHN2								
TAUMW	-	SEGSUB									
TAUMA	-	MNCHN4									
TAUMY	-	MNCHN4									
TAUN	-	IBM									
TAUNB	-	INPT									
TAUPL	-	LOOKUP									
TAUPLX	-	INPT									
TAURPL	-	LOOKUP									
TAUSAV	-	MNCHN4									

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TAUTO	-	IBM	LPDAPS	LPTO	MNCHN4	RHSUB	SEGSUB				
TAUTOV	-	LPDAPS	LPTO								
TAUTOW	-	RHSUB	SEGSUB								
TAUTOX	-	SEGSUB									
TAUTOZ	-	LPTO									
TAUW	-	AFPSUB	ASESUB	ASTSUB	AWESUB	GAMA2S	HDNSUB	IBM	INPT	LPDAPS	LPTO
	-	MNCHN3	MNCHN4	MODTSH	PLNCNS	PT1AA	RGISUB	ROF1SH	SCTOR1	SD1D13	SEGSUB
	-	S2SK	TISUB	VOLSUB	VSEC						
TAUWDM	-	MNCHN2	SCI								
TAUWDP	-	MNCHN1	MNCHN4	TISUB							
TAUWE1	-	MSISUB	MTISUB								
TAUWX	-	MODTSH	TISUB								
TAUWY	-	MODTSH	TISUB								
TAUZ	-	ASESUB	ASTSUB	HDNSUB	LOOKUP	MNCHN1	MNCHN4	RHSTSR	RHSUB	SEGSUB	TISUB
TAUZTO	-	LPDAPS	LPTO	MNCHN1	MNCHN4	SEGSUB	TISUB				
TA1B	-	INPT	LOOKUP								
TA2B	-	INPT	LOOKUP								
TBETA	-	NSCE	SUBSON								
TBLAKR	-	INPT	MNCHN4								
TBLCH	-	INPT	MNCHN4								
TBLPA	-	INPT	MNCHN4								
TCOMB	-	INPT	MNCHN4	NSCE	RHSTSB						
TDEL01	-	INPT	MODTSH								
TUGRE	-	P3SUB	RCSUB	ZISUB							
TDMAX	-	MNCHN3	SCI	VOLSUB							
TEMP	-	AFPSUB	AIBST	IBMOUT	LPDAPS	LPTO	NSCE	PLNCNS	PT1AA	P1SUB	RASUBH
	-	RGISUB	SCI	SCTOR1	SEGSUB	S2SK	TISUB	VSEC	VSTRSR		
	-	FUGRE	SLOT								
TEMPA	-	AFPSUB									
TEMPAP	-	AFPSUB									
TEMPB	-	AFPSUB									
TEMPO	-	LPTO									
TEMP1	-	ASESUB	AIBSUB	ARSSUB	AWESUB	ENDCSB	FUGRE	IBMOUT	MNCHN3	PT1AA	P1SUB
	-	RASUB	RASUBB	RGISUB	ROE1SH	SCI	SD1D13	SEGSUB	SETPH	S2SK	TUGRE
	-	TISUB	XRSUB	XRSUBB							
TEMP2	-	ASESUB	ARSSUB	AWESUB	ENDCSB	FUGRE	IBMOUT	MNCHN3	PT1AA	RASUB	RASUBH
	-	RCSUB	ROE1SH	SCI	SD1D13	SEGSUB	TUGRE	TISUB	VSEC	XRSUB	
TEMP3	-	ASESUB	ARSSUB	MNCHN3	RASUB	RASUBH	ROE1SH	SD1D13	SEGSUB	TUGRE	TISUB
	-	VSEC	XRSUB								
TEMP4	-	AWESUB	FUGRE	MNCHN3	ROE1SH	SCI	TISUB	XRSUB			
TEMP5	-	AWESUB	FUGRE	MNCHN3	RGISUB	TISUB	VSEC				
TEMP6	-	AIBSUB	AWESUB	MNCHN3	RGISUB	SETPH	TISUB	VSEC			
TEMP7	-	AWESUB	MNCHN3								
TEMP7b	-	AFPSUB									
TEMP8	-	AWESUB	MNCHN3								
TEM1	-	ENDCSB	LPDAPS	PLNCNS							
TEM2	-	ENDCSB	PLNCNS								
TEM3	-	ENDCSB									
TEM4	-	ENDCSB									
TEM5	-	ENDCSB									
TERAD	-	FUGRE									
TERM	-	IBMOUT									
TERM1	-	NSCE									
TERM2	-	NSCE									
TEST	-	TISUB									

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TO	-	AIBST	AIBSUB	INPT	MNCHN4	NSCE	RABTSB	SEGSUB	SETPH	SLOT	SUBSON
TOFLAG	-	IBM	MNCHN4	RBSUB	SEGSUB						
TOTEMP	-	MNCHN4									
TPR	-	MNCHN4	RABTSB								
TRAN	-	ASUBC	BSUBC	HAPSHC	HASUBC	HBPSHC	HASUBC	LPTO	MNCHN2	MNCHN3	SCI
TKSUB	-	INPT	MNCHN1	NSCE							
TS	-	AIBST	SLOT								
TSA	-	IBMOUT	SLOT								
TSE	-	IBM	IBMOUT	SLOT							
TSLUTA	-	IBM	IBMOUT	SEGSUB	SLOT	TISUB					
TSLUTF	-	IBM	IBMOUT	SEGSUB	SLOT	TISUB					
TSLVDM	-	IBM	MNCHN2	MNCHN3							
TSLVR	-	IBM	INPT	MNCHN2	MNCHN3	MNCHN4	MODTSB	SEGSUB			
TSLVRW	-	TISUB									
TSLVRX	-	MNCHN4	MODTSB	TISUB							
TSLVRV	-	MNCHN4	MODTSB	TISUB							
TSS	-	SETPH									
TSI	-	IBM	INPT	RABTSB	TISUB						
TIMP	-	AIBSUB	NSCE								
TV2	-	AFPSUB	LPDAPS								
TV4	-	AFPSUB	LPDAPS								
TV5	-	AFPSUB	LPDAPS								
TV6	-	AFPSUB	LPDAPS								
TV6PH	-	AFPSUB									
TV7	-	AFPSUB	LPDAPS								
TV7PH	-	AFPSUB									
TWH	-	VOLSUB									
TX	-	SETPH									
TXSUB	-	INPT	MNCHN1								
TX1	-	AIBST	SLOT								
TX2	-	AIBST	SLOT								
TY1	-	AIBST	SLOT								
TY2	-	AIBST	SLOT								
T1A	-	NSCE									
T1B	-	MNCHN4	NSCE								
T1BC	-	NSCE									
T1BG	-	NSCE									
T1BD	-	NSCE									
T1OM	-	LPDAPS	PLNCNS	RASUB							
T12M	-	LPDAPS	PLNCNS	PLNLCS	RASUB	RASUBH	SCI	SCTORI	XRSUBH		
T2M	-	LPDAPS	PLNCNS	PLNLCS	RASUB	RASUBH	SCI	SCTORI	XRSUB	XRSUBH	
T4M	-	LPDAPS	PLNCNS	RASUB							
T5M	-	LPDAPS	PLNCNS								
T6M	-	LPDAPS	PLNCNS	RASUB	RASUBH						
T7M	-	LPDAPS	PLNCNS								
T9M	-	LPDAPS	PLNCNS								
U	-	AIBST	AIBSUB	MNCHN4	NSCE	RBSUB	SEGSUB	SLOT			
UA	-	IBMOUT	MNCHN1	SLOT							
UBETA	-	NSCE	SUBSON								
UCR	-	RBSUB									
UF	-	IBM	IBMOUT	MNCHN1	SLOT						
UMA	-	NSCE	SUBSON								
UMAX	-	AIBST	SLOT								
UMB	-	NSCE									
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UIA	-	NSCE	SUBSUB					
UIB	-	MNCHN4	NSCE	SUBSUB				
V	-	AIBST	MNCHN1	MNCHN4	SLOT			
VARI	-	MNCHN4						
VCE	-	ENDCSB	MNCHN1					
VCH	-	MNCHN1	MNCHN4	RBSTSB	SETPH	VOLSUB		
VCHINP	-	IBM	INPT	MNCHN1	MNCHN4			
VCH	-	AIBST	MNCHN1	MNCHN4	RBSTSB	SETPH		
VCH	-	ENDCSB	MNCHN1	NSCE				
VCH	-	ENDCSB	MNCHN1	NSCE				
VCHINA	-	INPT	MNCHN1					
VCHINB	-	INPT	MNCHN1					
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VE	-	SETPH						
VEH	-	VOLSUB	VSEC					
VEX	-	HONSUB	MNCHN1	VOLSUB				
VF	-	ASESUB	ASTSUB	HONSUB	TIMEOUT	MNCHN4	SEGSUB	SETPH
VFCYL	-	IBMOUT						
VFLU	-	ENDCSB	MNCHN1					
VFH	-	IBMOUT	MNCHN3	MNCHN4	RBSTSB	SETPH	VOLSUB	VSEC
VFMW1	-	HONSUB	MNCHN1	VOLSUB				
VFH0	-	INPT	MNCHN1	MNCHN2	MNCHN3	MNCHN4	VOLSUB	
VFMHR	-	MNCHN4						
VFI	-	SEGSUB						
VFIN1	-	SETPH						
VFN	-	AIBST	IBMOUT	LOOKUP	MNCHN4	RBSTSB	SETPH	
VFNA	-	LOOKUP	MNCHN4	NSCE				
VFN8	-	LOOKUP	MNCHN4	NSCE				
VFNU	-	IBM	INPT	MNCHN1	MNCHN2	MNCHN4		
VFNDA	-	INPT	MNCHN1	MNCHN2	MNCHN4			
VFNDB	-	INPT	MNCHN1	MNCHN2	MNCHN4			
VFPF	-	SETPH	VFPF8					
VFPF8	-	SETPH						
VFWEB	-	SETPH						
VGA	-	NSCE	SUBSUB					
VGAZ	-	NSCE	SUBSUB					
VGB	-	NSCE						
VGBZ	-	NSCE						
VIS	-	SETPH						
VNOZSB	-	IBM	MNCHN1	NSCE				
VOLSUB	-	HONSUB						
VOLUME	-	RBSTSB						
VP	-	MNCHN4	RBSTSB	SEGSUB				
VPH	-	MNCHN4						
VPN	-	MNCHN4						
VPR	-	AIBST	MNCHN1	MNCHN4				
VR	-	HONSUB	MNCHN1	VOLSUB				
VXX	-	HONSUB	MNCHN1	VOLSUB				
VSFC	-	VOLSUB						
VSLVN	-	MNCHN1	MNCHN2	MNCHN4				
VSTD	-	HONSUB	MNCHN1	SECTOR	SZSK	VOLSUB		
VSTR	-	HONSUB	MNCHN1	SECTOR	SECTOR1	VOLSUB	VSTR8	
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		SETPH	SLOT	SUBSON							
WDOTD	-	AIBST	MNCHN4	SLOT							
WDOTI	-	AIBST	AIBSUB								
WDOTSU	-	SLOT									
WDOTSI	-	SLOT									
WDOTX	-	SETPH									
WF	-	IBMOUT	SETPH								
WFACT	-	IBM	INPT	SETPH							
WFI	-	SETPH									
WFTOL	-	INPT	SETPH								
WGPORI	-	SEGSUB	SETPH								
WGTOT	-	SETPH									
WI	-	MSISUB	MTISUB	PT1AA	SCTOR1	SD1013					
WIA	-	PT1AA	SD1013								
WIB	-	PT1AA	SD1013								
WIG	-	RGISUB									
WLE	-	RGISUB									
WORKA	-	ASESUB	AFPSUB	AIBST	ASESUB	ASTSUB	AWFSUB	BRACKSH	ENDCSH	GAMA2S	GAMSUB
		HDNSUB	HESUB	LPDAPS	LPTO	MNCHN1	MNCHN2	MNCHN3	MNCHN4	MODTSH	PLNCNS
		PLNLCS	PT1AA	PISUB	RASUB	RASUBB	RCSUB	RGISUB	ROE1SH	SCI	SCTOR1
		SD1013	SEGSUB	SETPH	SLOT	S2SK	TISUB	VFPSSH	VOLSUR	VSEC	VSTASH
		XRSUB	XRSUBB								
WORKDE	-	AWESUB	ENDCSB	HESUB	MNCHN1	MNCHN2	MNCHN3	RCSUB			
WORKRE	-	AWESUB	ENDCSB	HESUB	MNCHN1	MNCHN2	MNCHN3	RCSUB			
WORKRH	-	INPT	MNCHN1	MNCHN2	MNCHN3	MNCHN4	PCHWRT	RBSTSH	SFTPH	VOLSUR	
WORKRN	-	AIBST	IBM	INPT	MNCHN1	MNCHN2	MNCHN4	PCHWRT	RHSTSH	SETPH	
WORK4S	-	AWESUB	ENDCSH	GAMSUB	LPDAPS	LPTO	MNCHN1	MNCHN2	MNCHN3	PLNCNS	PLNLCS
		PISUB	RASUBB	SCI	SCTOR1	S2SK	VSEC	VSTRSH	XRSUB	XRSUBB	
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WSLOTI	-	IBMOUT	MNCHN1	SLOT							
WT	-	ASTSUB	MTISUB	PT1AA	RGISUB	SCTOR1	SD1013				
WTA	-	PT1AA	SD1013								
WTB	-	PT1AA	SD1013								
WTE	-	RGISUB									
WTH	-	MNCHN3	MSISUB	MTISUB							
WIST	-	ASTSUB	MNCHN3								
X	-	ACOS	ASIN	FDGRE	SDRT	TDGRE	TRAV	XLIN	ZERODV		
XBARI	-	MNCHN2	PT1AA	RGISUB	SD1013						
XBARIA	-	MNCHN2	PT1AA	SD1013							
XBARIB	-	MNCHN2	PT1AA	SD1013							
XBARIE	-	RGISUB									
XBARIH	-	ASTSUB	IBMOUT	MNCHN3	MSISUB	MTISUB	PT1AA	RGISUB	SCTOR1	SD1013	
XBARHF	-	MNCHN3									
XBARRI	-	MNCHN3									
XBARST	-	ASTSUB	MNCHN3								
XBH	-	IBMOUT	LOOKUP	MNCHN3	PT1AA	SD1013					
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XBIH	-	MNCHN3	MTISUB	SCTOR1							
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XBNB	-	LOOKUP									
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X76	-	PLNCNS							
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YA1	-	P3SUB							
YCG	-	MSISUB	MTISUB						
YI	-	MSISUB	MTISUB						
YMAX	-	MNCHN3	RGISUB	SCI					
YNO	-	AIGSUB							
YU	-	POSUB	PISUB	SCTOR1					
YDA	-	ROPSB	SCI	SCTOR1	VSTRSB				
YUAP	-	ROPSB							
YDH	-	OPRASB	ROPSB	SCI	SCTOR1	VSTRSB			
YORP	-	OPRASB	ROPSB						
YP	-	YPSUB							
YPI	-	LBSUB	MSISUB	MTISUB	ROEISB	SCTOR1	S2SK	VSEC	ZISUB
YPO	-	SCTOR1	S2SK	VSEC					
YPSUB	-	SCTOR1	S2SK	VSEC					
YPI	-	SCTOR1							
YPI0	-	SCTOR1							
YPI1	-	SCTOR1							
YPI2	-	SCTOR1							
YPI3	-	SCTOR1							
YP2	-	SCTOR1							
YP3	-	SCTOR1							
YP4	-	SCTOR1							
YP5	-	SCTOR1							
YP6	-	SCTOR1							
YRO	-	MSISUB	MTISUB						
YSOR	-	FOGRE							
YSOR1	-	FOGRE							
Y011	-	PLNCNS	XRSUB	XRSUBB					
Y03	-	PLNCNS	XRSUB	XRSUBB					
Y05	-	PLNCNS	RASUBB	XRSUB	XRSUBB				
Y07	-	PLNCNS	XRSUB	XRSUBB					
Y09	-	PLNCNS	XRSUB	XRSUBB					
Y1	-	MNCHN4	PISUB	P3SUB					
Y1A	-	SCI							
Y1B	-	SCI							
Y11A	-	SCTOR1							
Y11B	-	SCTOR1							
Y3	-	P3SUB							
Y3A	-	SCI	SCTOR1						
Y3B	-	SCI	SCTOR1						
Y45	-	PLNCNS	RASUB	RASUBB					
Y76	-	PLNCNS	RASUB						
Z	-	ACOS							
ZAA	-	PLNCNS							
ZA1	-	AWESUB							
ZCALC	-	IBMOUT	MNCHN1	MNCHN4	SEGSUB	SLOT	TISUB		
ZCG	-	MSISUB	MTISUB						
ZERODV	-	AFPSUB	A1BST	MNCHN4	PT1AA	RCSUB	SCI	SD1D13	SLOT
ZG	-	S2SK							
ZI	-	MSISUB	MTISUB	SCTOR1	S2SK	ZISUB			

ZISUB	-	SCTOR1	S2SK						
ZMAX	-	RGISUB	SCI						
ZU	-	POSUB	PISUB						
ZOA	-	BRASB	DPASB	SCI	VSTRSH				
ZOAP	-	DPASB	SCI						
ZUB	-	BRASB	SCI	VSTRSH					
ZORP	-	SCI							
ZP	-	YPSUB							
ZPO	-	SCTOR1	S2SK	VSEC					
ZPJ	-	LSUB	MSISUB	MTISUB	ROEISB	SCTOR1	S2SK	VSEC	XRTMR
ZRO	-	MSISUB	MTISUB						
ZX	-	SEGSUB							
ZI	-	AWESUB	PISUB	PJSUB					
ZIA	-	SCI							
ZIAA	-	FDGRE							
ZIAT	-	PISUB	PJSUB						
ZIB	-	SCI							
ZII	-	FDGRE							
ZIAA	-	FDGRE							
Z22	-	FDGRE							
ZJ	-	PJSUB							
ZJA	-	SCI							
ZJAA	-	FDGRE							
ZJB	-	SCI							
ZJJ	-	FDGRE							

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